CLEVELAND OPPORTUNITY CORRIDOR
OHIO DEPARTMENT OF TRANSPORTATION

Operational Analysis Technical Memorandum

PID 77333

Opportunity Corridor
Cuyahoga County, OH

Submitted to:

Ohio Department of Transportation
5500 Transportation Blvd
Garfield Heights, Ohio 44125

Submitted by:

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May 2012
Revised June 2012

HNTB

Operational Analysis
Technical Memorandum
CUY - Opportunity Corridor Project, PID No. 77333
Cuyahoga County, Ohio

Prepared for

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

The Opportunity Corridor project area is located in the City of Cleveland in Cuyahoga County, Ohio. The western study area limits are the I-490 approach to the I-490/E. 55th Street intersection in the Slavic Village area. The eastern study area limits are the E. 105th Street/Chester Avenue intersection in the University Circle area. The study area boundary is shown in **Appendix A, Exhibit 1**.The purpose of this project is to improve the transportation infrastructure, access, and mobility within a historically underserved, economically depressed area within the City of Cleveland. Throughout the Ohio Department of Transportation (ODOT) Projefct Development Process (PDP), a No Build and various Build alternatives have been considered. Through coordination with the project's Steering Committee, ODOT, the City of Cleveland and the general public, a Recommended Preferred Alternative has been identified. This alternative involves the construction of a new arterial roadway (urban boulevard). The design speed of the proposed urban boulevard would be 40 mph (35 mph legal speed), and it would consist of a four- to five-lane typical section with turn lanes at intersections. It would extend from the I-490/E. 55th Street intersection in the west to the E. 105th Street/Chester Avenue intersection in the east. **Appendix A, Exhibit 1** shows the proposed alignment of the Opportunity Corridor project.

Between the I-490/E. 55th Street intersection and Quincy Avenue, the proposed boulevard would generally be on new alignment. From Quincy Avenue to Chester Avenue, the roadway would be constructed along the existing E. 105th Street alignment. The boulevard would include a depressed, grassy median between E. 55th Street and Quincy Avenue. In addition, wide outside travel lanes would be provided for shared use with bicycle traffic. The proposed boulevard would also include a multi-use path on the south side of the roadway and a sidewalk on the north side of the roadway.

The Recommended Preferred Alternative consists of the alignment that minimizes impacts and interfaces most effectively with the existing roadway network. Beginning in the west, the boulevard will be depressed and cross under existing E. 55th Street. A quadrant roadway will be built in the southeast quadrant of the grade separation to provide full access to and from E. 55th Street. The 35 mph speed limit for the boulevard begins at the E. 55th Street overpass. The I-490 approach and the ramps from I-77 to EB I-490 will be reconfigured. The existing I-77 NB and SB ramps merge into a two-lane ramp and then join EB I-490 with an inside merge. This type of merge does not meet current design standards and will be reconfigured to first merge into a one lane ramp and then join into I-490 as an add lane. The No Build and Build lane configuration at the I-490/I-77 interchange is illustrated in **Appendix A, Exhibit 2**. East of E. 55th Street, The boulevard will include the following signalized intersections:

- E. 55th Street and the quadrant roadway
- Boulevard and the quadrant roadway
- Boulevard and Kinsman Road
- Boulevard and E. 75th Street
- Boulevard and E. 79th Street
- Boulevard and Buckeye Road
- Boulevard and Woodland Avenue
- Boulevard and E. 93rd Street
- Quincy Avenue and Boulevard/E.105th Street
- Cedar Avenue and E. 105th Street
- Carnegie Avenue and E. 105th Street
- Euclid Avenue and E. 105th Street
- Chester Avenue and E. 105th Street

This document presents the traffic operational analysis methodology, results, and proposed lane use for the Recommended Preferred Alternative.

2.0 TRAFFIC VOLUMES

The first step in developing the certified traffic for this project was to update the regional Travel Demand Model (TDM) to include traffic associated with future development. As a result, HNTB updated the Northeast Ohio Areawide Coordinating Agency's (NOACA's) TDM to incorporate planned development anticipated to occur independent of the proposed boulevard and complementary development anticipated to occur in conjunction with the proposed boulevard. A *Travel Demand Model Enhancements Technical Memorandum (December, 2011)* summarizes the process used to update the TDM.

After the TDM was updated, the resulting traffic assignments were post-processed to develop traffic plates for the design year Build and No Build scenarios. A *Turning Movement Traffic Volume Forecasting Technical Memorandum (December, 2011)* summarizes the methodology used to develop the design year traffic forecasts. The traffic plates were certified by ODOT's Office of Technical Services on April 11, 2012.

Subsequently, it was determined that the eastern leg of Quincy Avenue would be closed due to geometric constraints. The traffic using this leg was distributed to Buckeye Road and E. 93rd Street via Woodland Avenue. These traffic volumes were analyzed to determine the lane use described in this document.

All certified traffic information can be found in **Appendix B**.

2.1 DESIGN YEAR

The anticipated Opening Year of the project is 2020, therefore, traffic assignments were generated for 2020 and 2040. Because anticipated development was estimated for ten year periods, traffic assignments were also generated for 2030. To determine the most appropriate design year, the volumes were analyzed to establish which year will require the largest roadway footprint. To do so, the AM and PM peak traffic volumes at each intersection were compared using the following measures:

1. Total volume by approach
2. The magnitude of conflicting movements

Although the variation between 2020, 2030 and 2040 was no more than one-percent (1%), each comparison showed 2020 as the year with the highest volumes and most conflicting movements. Therefore, 2020 was designated as both the Opening Year and Design Year for the purposes of the traffic analysis.

2.2 NO BUILD CONDITION

The No Build condition for this project is defined as the existing roadway network contained in and surrounding the study area limits. The No Build condition also assumes that the improvements related to the Cleveland Innerbelt project have been built and are operational by the opening day (2020). It is also assumed that existing and planned development projects, as identified by area Community Development Corporations (CDCs), will be in place. Because the majority of the intersections associated with the proposed project do not currently exist, a separate traffic analysis of the No Build condition was not completed.

2.3 BUILD CONDITION

The Build condition includes the construction of the Recommended Preferred Alternative, as discussed in **Section 1.0**, as well as the Cleveland Innerbelt construction and development assumptions from the No Build scenario. In addition, the Build condition assumes additional complementary development occurs in conjunction with the proposed boulevard.

Information on specific development projects, assumptions and distributions can be found in the *Travel Demand Model Enhancements Technical Memorandum* dated December 22, 2011.

3.0 TRAFFIC ANALYSIS

3.1 SIGNALIZED INTERSECTIONS

3.1.1 Methodology

"Level of Service (LOS) is a quantitative stratification of a performance measure or measures that represent quality of service (*Highway Capacity Manual, 2010).*" Performance measures vary by facility type and generally include density, percent-time spent following, average travel speed, percent free-flow speed, and control delay. Level of service designations range from A to F. Level of service A describes near-ideal traffic operations characterized by excellent progression of the traffic stream. Level of service F, on the other hand, is characterized by heavy congestion and long delays.

For signalized intersections, control delay is used to estimate LOS. Control delay includes the time consumed by initial deceleration, queue move-up, stopped traffic, and final acceleration that would not occur in the absence of traffic control. The level of service criteria for these areas is summarized in **Table 1**. Generally, for urban, built-up areas, an acceptable level of service is LOS D.

In some cases, the average control delay per vehicle for an intersection may result in an acceptable LOS, but certain movements could be nearing their capacity. This is measured by the volume-to-capacity ratio (v/c). A v/c ratio above 1.0 automatically assigns a LOS F to that movement, indicating that the demand exceeds capacity. Generally, a v/c ratio less than 0.90 is preferred.

Table 1: Signalized Intersection LOS Criteria

Signalized Intersection LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80 orv/c >1.00

Level of service analyses were conducted for the Design Year of 2020. Analysis was performed for both the AM and PM peak hours. Highway Capacity Software (HCS) and Synchro were used for the analyses.

Signalized intersections along the corridor were analyzed in HCS to determine the lane use for the proposed boulevard and intersecting side streets. The approach delays were balanced by adjusting the

green time for the signalized intersection to make the approach delay for the highest north/south approach equal, or nearly equal, to the highest east/west approach, per ODOT's guidance in Appendix C of its *Location and Design Manual, Volume 1*. Coordination meetings were held with the City of Cleveland and ODOT to gain their concurrence with this approach on January 26 and January 30, 2012, respectively. Both agencies agreed that it was preferred to have acceptable LOS and v/c ratios less than 0.9 but would consider higher v/c ratios depending on the costs and impacts. Copies of the minutes from both meetings are included in **Appendix C**. The lane use presented in this document provides acceptable LOS, minimizes delay, and achieves v/c ratios under 0.90 where possible.

The lane configuration identified using HCS was then modeled using Synchro to determine operations with optimized signal coordination along the corridor for the AM and PM peak hours. Results for the AM and PM peak hour Synchro analysis are included in **Appendix F** and **Appendix G**.

3.1.2 Highway Capacity Software Analysis

HCS 2010 analysis was completed for the 13 signalized intersections along the proposed boulevard. Due to limitations or errors in the 2010 software, HCS+ was used as necessary. As discussed in **Section 3.1.1**, the approach delays were balanced in accordance to Appendix C of ODOT's *Location and Design Manual, Volume 1*.

AM Peak Hour

HCS results indicate intersection levels of service ranging from LOS C to LOS D during the AM peak hour for the 2020 Build condition. All movements operate with a v/c ratio less than 0.90 and LOS D or better.

A figure showing lane use and LOS based on HCS analysis is included as **Appendix A, Exhibits 3a-3c.** The identification number in parenthesis corresponds to the HCS results provided in **Appendix D**.

PM Peak Hour

HCS results indicate intersection levels of service ranging from LOS B to LOS D during the PM peak hour for the 2020 Build condition. However, one movement at the intersection of E. 105th Street/Boulevard and Euclid Avenue operates below acceptable levels.

The northbound left movement at Euclid Avenue operates with a v/c ratio of 0.94 and LOS F with a delay of 115 seconds. Euclid Avenue currently operates as a Bus Rapid Transit (BRT) corridor. It was constructed in 2008 and creates a constraint when designing E. 105th Street to meet the operational requirements of the project. HCS has limitations in modeling this intersection. To accommodate the protected bus movements, a "dummy" phase of 6.5 seconds was added to the eastbound and westbound left turn movements. This may have resulted in a conservative result. The northbound left turn volume is low (90 vehicles). Operational concerns will be mitigated by providing a turn lane that is 400 feet to accommodate storage, deceleration, taper, and through back up (see **Section 3.3**). In addition, there are several east-west roadways that intersect with E. 105th Street and provide alternate routes to Euclid Avenue. Given the limitations in the analysis methodology, the overall operation of the intersection (LOS D), the low northbound turning volume, and the provided storage, further changes to this intersection are not recommended.

A figure showing lane use and LOS based on HCS analysis is included as **Appendix A, Exhibits 3a-3c.** The northbound left turn movement operational results, as described above, are identified on these figures. The identification number in parenthesis corresponds to the HCS results provided in **Appendix E**.

3.2 FREEWAY SEGMENTS AND RAMPS

The only freeway components analyzed as a part of this project is the I-490 approach to the E. 55th Street intersection and the adjacent I-77 ramps. During a coordination meeting with ODOT on January 30, 2012, it was established that an Interchange Modification Study (IMS) was not required for this project. Minutes from this meeting are attached in **Appendix C.**

3.2.1 Methodology

Similar to signalized intersections, LOS represents the performance of freeway segments and ramp operations. The performance measure for level of service on freeway segments is traffic density (passenger cars/mile/lane or pc/mi/ln). Density is a reflection of the freedom to maneuver within the traffic stream and the spacing between vehicles on the freeway segment. The level of service criteria for freeway segments is summarized in **Table 2**.

Table 2: Basic Freeway Segment LOS Criteria

Basic Freeway Segment LOS	Density (pc/mi/ln)
A	≤ 11
B	> 11-18
C	> 18-26
D	> 26-35
E	> 35-45
F	> 45 or any component v/c >1.00

A ramp is a length of roadway providing an exclusive connection between two highway facilities. The ramp junction is the short segment of highway along which vehicles transfer from an entrance ramp to the main roadway or from the main roadway to an exit ramp. At the typical ramp junction, entering vehicles will have a short distance to accelerate and merge into the main traffic stream and exiting vehicles will have a short distance to diverge and decelerate. The number of highway lanes upstream of ramp junction will equal to the number of highway lanes downstream of the ramp junction. This is the configuration in which the procedures in the Highway Capacity Manual are intended to analyze. A special condition occurs when the entrance ramp forms an additional highway lane (add lane) or when a highway lane forms the exiting ramp (drop lane). In this configuration, the number of mainline lanes upstream of the ramp junction is not equal to the number of lanes downstream of the ramp junction. At these locations, the capacity of the ramp roadway will determine the operation of the ramp. The ramp roadway is treated as a basic freeway segment to determine LOS. Basic freeway segment analysis cannot be made for a one-lane freeway segment. To overcome this limitation, one-lane segment volumes were doubled and entered into HCS as two lanes of traffic.

Like basic freeway segments, the performance measure for level of service in merge and diverge areas is traffic density. The level of service criteria for these areas is summarized in **Table 3, page 6**.

Table 3: Merge and Diverge LOS Criteria

Merge and Diverge LOS	Density (pc/mi/ln)
A	≤ 10
B	> 10-20
C	> 20-28
D	> 28-35
E	> 35
F	demand exceeds capacity

The I-490 approach and adjacent I-77 ramps will be modified to accommodate the new geometry of the I-490/E. 55th Street area and to correct current design deficiencies. The existing I-77 on ramp configuration consists of a one lane ramp from I-77N joining a one lane ramp from I-77S to form a two-lane ramp that then enters I-490E with an inside merge. In the Recommended Preferred Alternative, the inside merge will be eliminated by merging the two-lane ramp down to one lane before reaching I-490. The single lane on ramp will then join into I-490E as an add-lane. The add-lane will continue eastbound and terminate as an exclusive right-turn lane at E. 93rd Street. The No Build and Build lane use configuration at the I-490/I-77 interchange is illustrated in **Appendix A, Exhibit 2**.

To ensure acceptable operations, the proposed configuration was analyzed as shown below. The freeway elements are labeled in **Appendix A, Exhibit 3a**.

- I-490 mainline, west of the I-77 on ramp, was analyzed as basic freeway segment (F-4 and F-8).
- The one-lane ramps from I-77N and I-77S to I-490E were analyzed by doubling the volume on the ramps and analyzing as two-lane basic freeway segments (F-1 and F-2).
- The one-lane I-77 on ramp was analyzed by doubling the volume on the ramp and analyzing as a two-lane basic freeway segment after the merge and before the entrance to I-490E (F-3).
- The one-lane off ramp from I-490W to I-77 was analyzed as a diverge area (M-1).
- The one-lane off ramp from I-490W opens up to two lanes prior to splitting to I-77N and I-77S. The two-lane section was analyzed as a basic freeway segment (F-5).
- The one-lane ramps to I-77S and I-77N from I-490W were analyzed by doubling the volume on the ramps and analyzing as two-lane basic freeway segments (F-6 and F-7).

3.2.2 Highway Capacity Software Analysis

Results indicate that each freeway segment and ramp will operate at LOS A or LOS B in both the AM and PM peak hours in the 2020 Build condition. The identification number in parenthesis corresponds to the HCS results provided in **Appendices H** and **Appendix I** and summarized in **Appendix A, Exhibit 3a**.

3.3 TURN LANE LENGTHS

The necessary turn lane lengths were determined for the thirteen intersections along the proposed boulevard. All turn lane length computations are based on proposed lane use and design year (2020) traffic. Calculations were performed according to ODOT's *Location and Design Manual (L&D), Volume 1*. If results indicate the turn lane is blocked by through back-up, the required turn lane length was dictated by the back-up length. In some instances, the through backup exceeded maximum turn lane length in accordance to *ODOT L&D Volume 1*, Sections 401.6.1 and 401.6.3. In these situations, the turn

lanes were limited to the maximum length. **Table 4, page 8** shows the results of the turn lane length computations for each intersection.

Table 4 also lists the actual turn lane length provided in the preliminary design. There are some locations where the required length based on ODOT's methodology cannot be met due to geometric or property impact considerations. For these locations, average queue lengths were observed using SimTraffic. SimTraffic takes into account the signal timing and progression optimization that was performed in Synchro and records the maximum back of queue observed for every two minute period. The average queue is the average of all the two minute maximum queues. Average queues results were available for each movement during each peak hour analyzed. The maximum of these results were used to evaluate turn lane lengths. At several locations where turn lane lengths as specified by ODOT's methodology could not be met, adequate storage could be provided based on the SimTraffic results. These locations are indicated in **Table 4**.

A total of six intersections have at least one exclusive turn lane in which the length will not meet the requirements of either ODOT's methodology or SimTraffic. These turn lanes are illustrated with italicized text within **Table 4**. Several of these locations are limited by the proximity of the existing adjacent intersection. Another constraint that limits the turn lane lengths includes nearby existing bridges that would add substantial cost to the project. The existing Euclid Corridor BRT also creates constraints for providing additional length along Euclid Avenue. An explanation of these limitations is included in **Table 4**.

The majority of the turn lane length requirements are dictated by through back-up. For those locations in which the hourly volumes are low and storage requirements are minimal but the through backup creates long turn lanes, it is recommended that these lengths be revisited and possibly shortened during detail design.

Table 4: Turn Lane Lengths

E-W Road	N-S Road	Direction	ODOT Methodology			SimTraffic	Actual Length Provided (ft)	If not met, reasons why
			Turn Lane Length (includes 50' taper)	Through Backup Based on Storage (ft) (does not include 50' taper)	Actual Turn Lane Length Required (based on Calculations)	Average Queue – (ft) *		
Quadrant	E55th	WB Left	400	0	400		440	
		WB Right	325	0	325		440	
		SB Left	375	750	650	145	485	Existing bridge over RTA Provided length exceeds average queue length required per SimTraffic
Boulevard	Quadrant	WB Left	386	750	650		650	
		NB Left	225	0	225		300	
		NB Left (2)	175	0	175		300	
		NB Right	375	0	375		375	
Boulevard	Kinsman	EB Left	161	775	650	185	290	Proposed bridge over Kingsbury Valley Provided length exceed average queue length required per SimTraffic
		WB Left	161	725	650	327	340	Proposed bridge over RTA Provided length exceed average queue length required per SimTraffic
		NB Left	400	250	400	139	390	Limited by existing E. 69th Street Provided length exceed average queue length required per SimTraffic
		SB Left	100	200	250	77	220	Existing bridge over RTA Provided length exceed average queue length required per SimTraffic
Boulevard	E75th	EB Left	211	725	650		650	
		WB Left	161	725	650	292	400	Storage space split with E. 79th Provided length exceed average queue length required per SimTraffic
		NB Left	100	100	150		150	
		SB Left	100	100	150	96	140	Limited by existing Grand Avenue Provided length exceed average queue length required per SimTraffic
Boulevard	E79th	EB Left	211	725	650	427	460	Storage space split with 75th Provided length exceed average queue length required per SimTraffic
		WB Left	386	650	650		650	
		NB Left	225	400	450		450	
		NB Right	300	400	450		450	
		SB Left	100	400	450		450	
Boulevard	*Buckeye*	EB Left	161	675	650		650	
		WB Left	*311*	*675*	*650*	*302*	*290*	*Storage space split with Woodland (40 vehicles in the AM, 140 vehicles in the PM)*
		NB Left	325	550	600	311	425	Commercial building to the north Provided length exceed average queue length required per SimTraffic
		SB Left	100	400	450	175	225	Existing bridge over RTA Provided length exceed average queue length required per SimTraffic
Boulevard	*Woodland*	*EB Left*	*161*	*775*	*650*	*374*	*295*	*Storage space split with Buckeye (10 vehicles in the AM, 10 vehicles in the PM)*
		WB Left	161	725	650		650	
		NB Left	375	175	375		375	
		SB Left	200	175	225		225	

*SimTraffic average queues results were available for each movement during each peak hour analyzed. The maximum of these results were used to evaluate turn lane lengths.

E-W Road	N-S Road	Direction	ODOT Methodology			SimTraffic	Actual Length Provided (ft)	If not met, reasons why
			Turn Lane Length (includes 50' taper)	Through Backup Based on Storage (ft) (does not include 50' taper)	Actual Turn Lane Length Required (based on Calculations)	Average Queue – (ft) *		
Boulevard	*E93rd*	EB Left	600	825	650	232	460	Storage space split with Woodland Provided length exceeds average queue length required per SimTraffic
		EB Right	161	825	850	192	460	Drop lane - Limited by intersection with Woodland Avenue Provided length exceeds average queue length required per SimTraffic
		WB Left	311	550	600		600	
		NB Left	*100*	*500*	*550*	*321*	*185*	*Storage space split with Woodland (10 vehicles in the AM, 10 vehicles in the PM)*
		NB Right	*325*	*500*	*550*	*321*	*225*	*Existing building to the east (200 vehicles in the AM, 180 vehicles in the PM)*
		SB Left	*100*	*525*	*575*	*487*	*290*	*Existing bridge over RTA (10 vehicles in the AM, 10 vehicles in the PM)*
		SB Right	*450*	*525*	*575*	*487*	*240*	*Existing bridge over RTA (220 vehicles in the AM, 320 vehicles in the PM)*
Quincy	Boulevard	EB Left	100	100	150		250	
		EB Right	100	100	150		250	
		NB Left	311	850	650		650	
Cedar	Boulevard	EB Left	200	250	300	114	210	Limited by existing E. 103rd Street Provided length exceeds average queue length required per SimTraffic
		WB Left	250	375	425	159	345	Turn lane begins at E. 106th Street Provided length exceeds average queue length required per SimTraffic
		NB Left	161	600	650	184	440	Limited by existing Frank Avenue Provided length exceeds average queue length required per SimTraffic
		SB Left	211	525	575	148	255	Storage space split with Carnegie Provided length exceeds average queue length required per SimTraffic
Carnegie	*Boulevard*	*EB Left*	*200*	*800*	*650*	*450*	*340*	*Limited by existing E. 102nd Street (10 vehicles in the AM, 70 vehicles in the PM)*
		WB Left	*300*	*850*	*650*	*477*	*250*	*Limited by existing E. 106th Street (180 vehicles in the AM, 150 vehicles in the PM)*
		WB Right	225	850	850	477	640	Limited by existing Stokes Boulevard Provided length exceeds average queue length required per SimTraffic
		NB Left	211	450	500	230	325	Storage space split with Cedar Provided length exceeds average queue length required per SimTraffic
		SB Left	261	500	550	253	335	TWLTL for drive to the north Provided length exceeds average queue length required per SimTraffic
Euclid	*Boulevard*	*EB Left*	*425*	*500*	*550*	*442*	*150*	*Limited by existing BRT condition (160 vehicles in the AM, 290 vehicles in the PM)*
		WB Left	*425*	*525*	*575*	*251*	*120*	*Limited by existing BRT condition (40 vehicles in the AM, 290 vehicles in the PM)*
		NB Left	261	350	400		400	
		NB Right	661	350	661		710	Drop lane
		SB Left	211	450	500	203	280	Storage space split with Chester Provided length exceeds average queue length required per SimTraffic
Chester	*Boulevard*	EB Left	300	600	650	257	300	Limited by existing E. 101st Street Provided length exceeds average queue length required per SimTraffic
		WB Left	100	725	650	290	530	Limited by existing E. 107th Street Provided length exceeds average queue length required per SimTraffic
		NB Left	261	500	550	128	285	Storage space split with Euclid Provided length exceeds average queue length required per SimTraffic
		SB Left	*211*	*400*	*450*	*210*	*180*	*Limited by existing Park Lane/Ansel (40 vehicles in the AM, 40 vehicles in the PM)*

*SimTraffic average queues results were available for each movement during each peak hour analyzed. The maximum of these results were used to evaluate turn lane lengths.

4.0 CONCLUSION

Throughout the ODOT PDP, a No Build and various Build alternatives for the Opportunity Corridor project have been considered. Through coordination with the project's Steering Committee, ODOT, the City of Cleveland and the general public, a Recommended Preferred Alternative has been identified as described in **Section 1.0**. A series of traffic operational analyses were performed using 2020 AM and PM peak hour volumes using both HCS and Synchro.

Typically, the City of Cleveland and ODOT prefer that all movements have a v/c ratio less than 0.9 and LOS D or better. For HCS analyses, they also utilize a methodology in which the approach delays are balanced - the highest north/south approach delay equal, or nearly equal, to the highest east/west approach delay. This methodology was used to analyze the 2020 AM and PM peak hour volumes to establish the final lane use for the recommended preferred alternative. The roadway network established from HCS analyses was then modeled using Synchro to determine operations with optimized signal coordination along the corridor. The Synchro results are summarized in **Appendix F** and **Appendix G**.

Results of the HCS analysis indicate twelve of the thirteen intersections operate with acceptable levels of service and all movements with v/c ratios less than 0.9 and LOS a D or better in both the AM and PM peak hours.

HCS analyses indicate the northbound left turn lane at the Euclid intersection operates below acceptable levels for the PM Peak. Euclid Avenue currently operates as a Bus Rapid Transit (BRT) corridor. It was constructed in 2008 and creates a constraint when designing E. 105th Street to meet the operational requirements of the project. HCS has limitations in modeling this intersection. To accommodate the protected bus movements, a "dummy" phase of 6.5 seconds was added to the eastbound and westbound left turn movements. This may have resulted in a conservative result. The northbound left turn volume is low (90 vehicles). Operational concerns will be mitigated by providing a turn lane that is 400 feet to accommodate storage, deceleration, taper, and through back up. In addition, there are several east-west roadways that intersect with E. 105th Street and provide alternate routes to Euclid Avenue. Given the limitations in the analysis methodology, the overall operation of the intersection (LOS D), the low v/c ratios, the low turning volume, the provided storage, and the geometric constraints, further changes to this intersection are not recommended.

Turn lane length calculation were also performed for each exclusive turn lane proposed in the recommended preferred alternative. Calculations were performed according to ODOT's *Location and Design Manual (L&D), Volume 1*. If results indicated the turn lane is blocked by through back-up, the required turn lane length was dictated by the back-up length. In some instances, the through back-up exceeded maximum turn lane length. For locations in which these required lengths could not be met, SimTraffic was used to determine turn lane length requirements. Six of the thirteen intersections have at least one exclusive turn lane in which the length designed will not meet the requirement in accordance to ODOT's methodology or SimTraffic. Several of these locations are limited by the proximity of existing adjacent intersections or an existing bridge. Extending turn lane lengths at these locations would add substantial cost to the project.

The analyses results in the development of the final lane use and footprint that will be used to measure impacts, complete the Environmental Impact Statement and complete final design. The final lane use and LOS results based on HCS analysis are shown in **Exhibits 3a-3c** in **Appendix A**.

Appendix A: Exhibits

Exhibit 1: Study Area

Exhibit 2: Build and No Build I-490/I-77 Ramp Configuration

Exhibit 3a-3c: Lane Use and Level of Service

LEGEND

- Opportunity Corridor Study Area
- Recommended Preferred Alternative Centerline
- Recommended Preferred Alternative Preliminary Right of Way

Wade Park Ave
E. 105th St
20
322
Mayfield Rd
Hough Ave
E. 30th St
E. 40th St
322
20
Chester Ave
Euclid Ave
Carnegie Ave
Cedar Ave
E. 55th St
E. 71st St
E. 79th St
Central Ave
Quincy Ave
77
43
422
Broadway Ave
87
Woodland Ave
Buckeye Rd
87
Shaker Blvd
490
422
Kinsman Rd
Woodhill Rd
E. 116th St
E. 130th St
77

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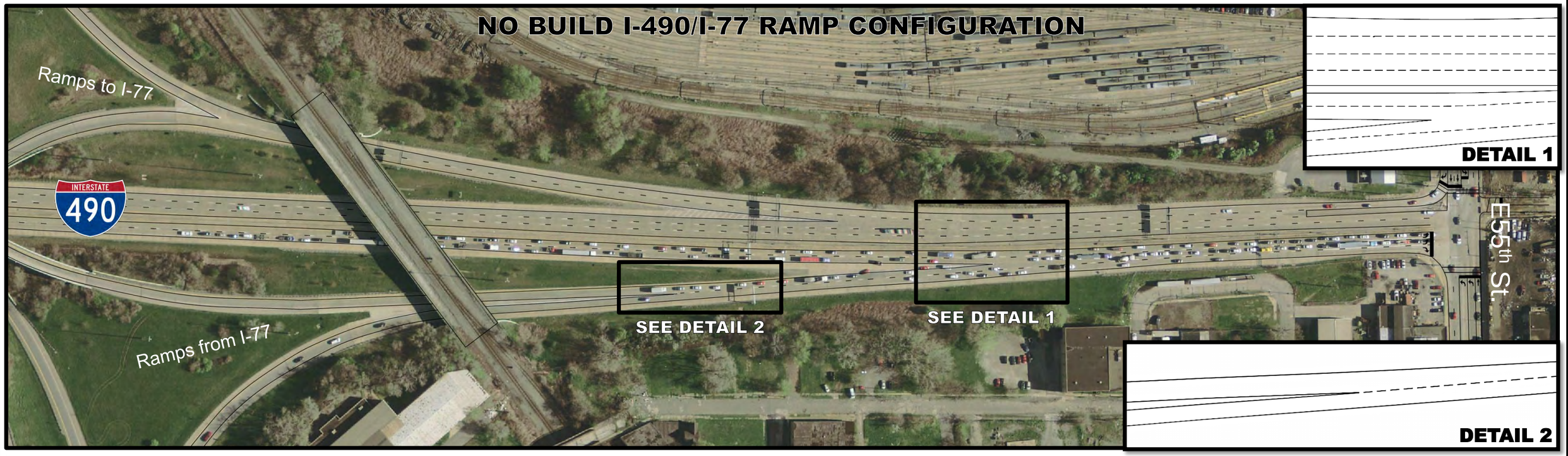
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

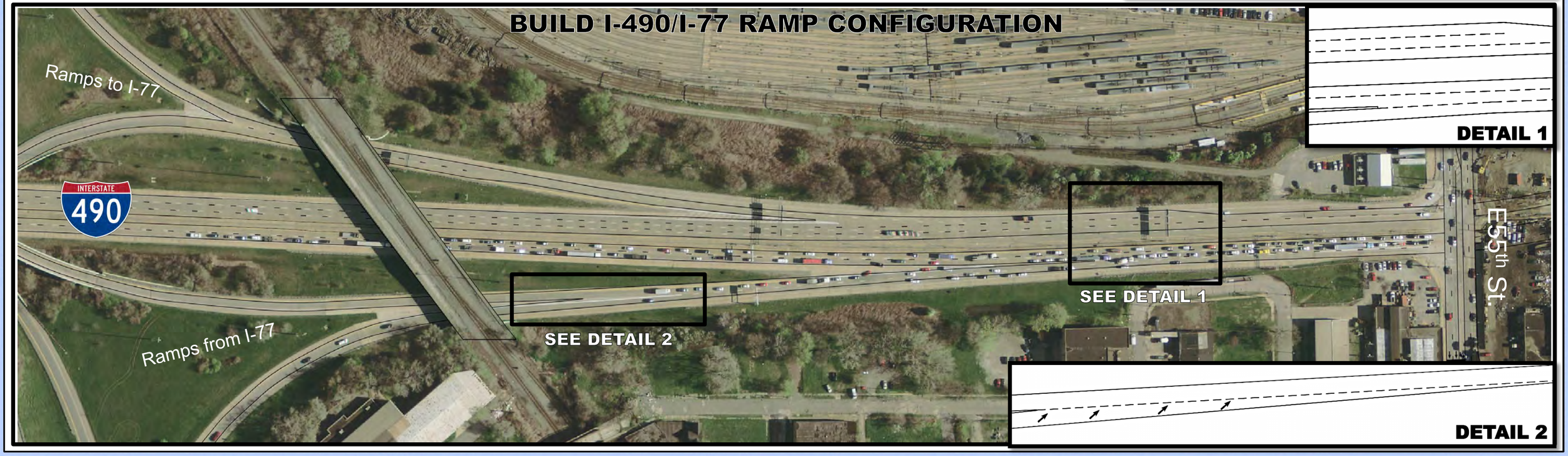
Exhibit 1: Study Area

NORTH
NOT TO SCALE

NO BUILD I-490/I-77 RAMP CONFIGURATION



BUILD I-490/I-77 RAMP CONFIGURATION



CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Exhibit 2: Build and No Build I-490/I-77 Ramp Configuration

NORTH
NOT TO SCALE

Legend

LOS (AM LOS PM LOS)

A | B | C | D | E | F

Analysis Type

- Signalized Intersection
- Basic Freeway Segment
- Merge/Diverge Movement

Critical Traffic Operations

- Movement with v/c >0.90
- Movement with LOS E

I-## Signalized Intersection ID Number
F-## Basic Freeway Segment ID Number
M-## Merge/Diverge Movement ID Number

ID numbers correspond to analyses results in Appendices D-J

WOODLAND AVE
KINSMAN RD
GCRTA RED LINE
GRAND AVE
CRAYTON AVE
DIAMOND AVE
GRAND AVE
NS NICKELPLATE LINE
E. 55th ST
E. 68th ST
COLFAX RD
GCRTA BLUE & GREEN LINE
E73rd
BERWICK RD
BOWER AVE
I-490
PRAHA AVE
E. 57th ST
E. 61st ST

I-1 C B
I-2 C B
I-3 C C

F-1 A A
F-2 A A
F-3 A B
F-4 B A
F-5 B A
F-6 A A
F-7 A A
F-8 A A
M-1 A A

CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Exhibit 3a: Lane Use and Level of Service
HCS Results - Balanced Approach Delays
Build Network (West Section)

NORTH
NOT TO SCALE

Legend

LOS (AM LOS PM LOS)

A B C D E F

Analysis Type

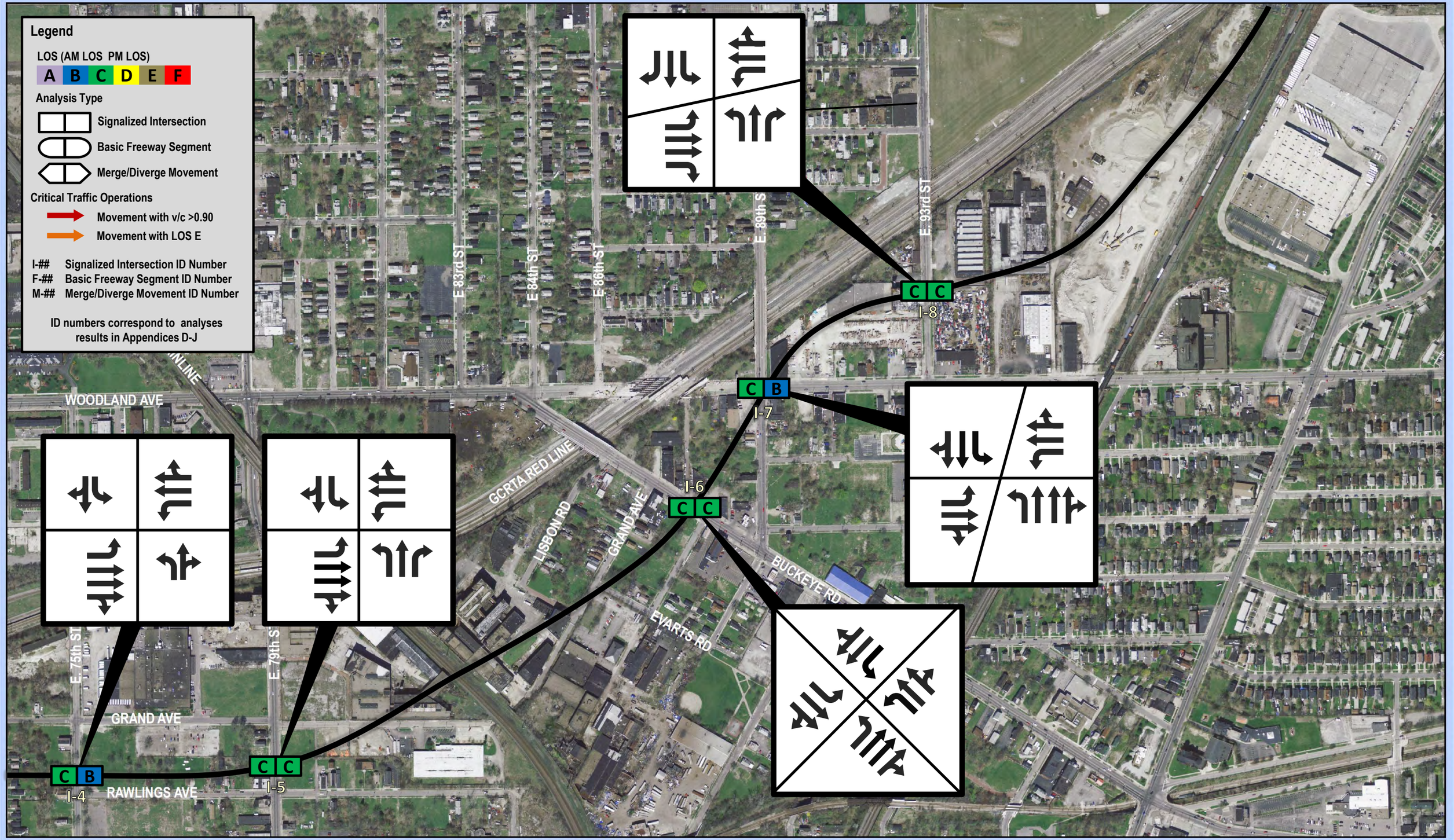
- Signalized Intersection
- Basic Freeway Segment
- Merge/Diverge Movement

Critical Traffic Operations

- Movement with v/c >0.90
- Movement with LOS E

I-## Signalized Intersection ID Number
F-## Basic Freeway Segment ID Number
M-## Merge/Diverge Movement ID Number

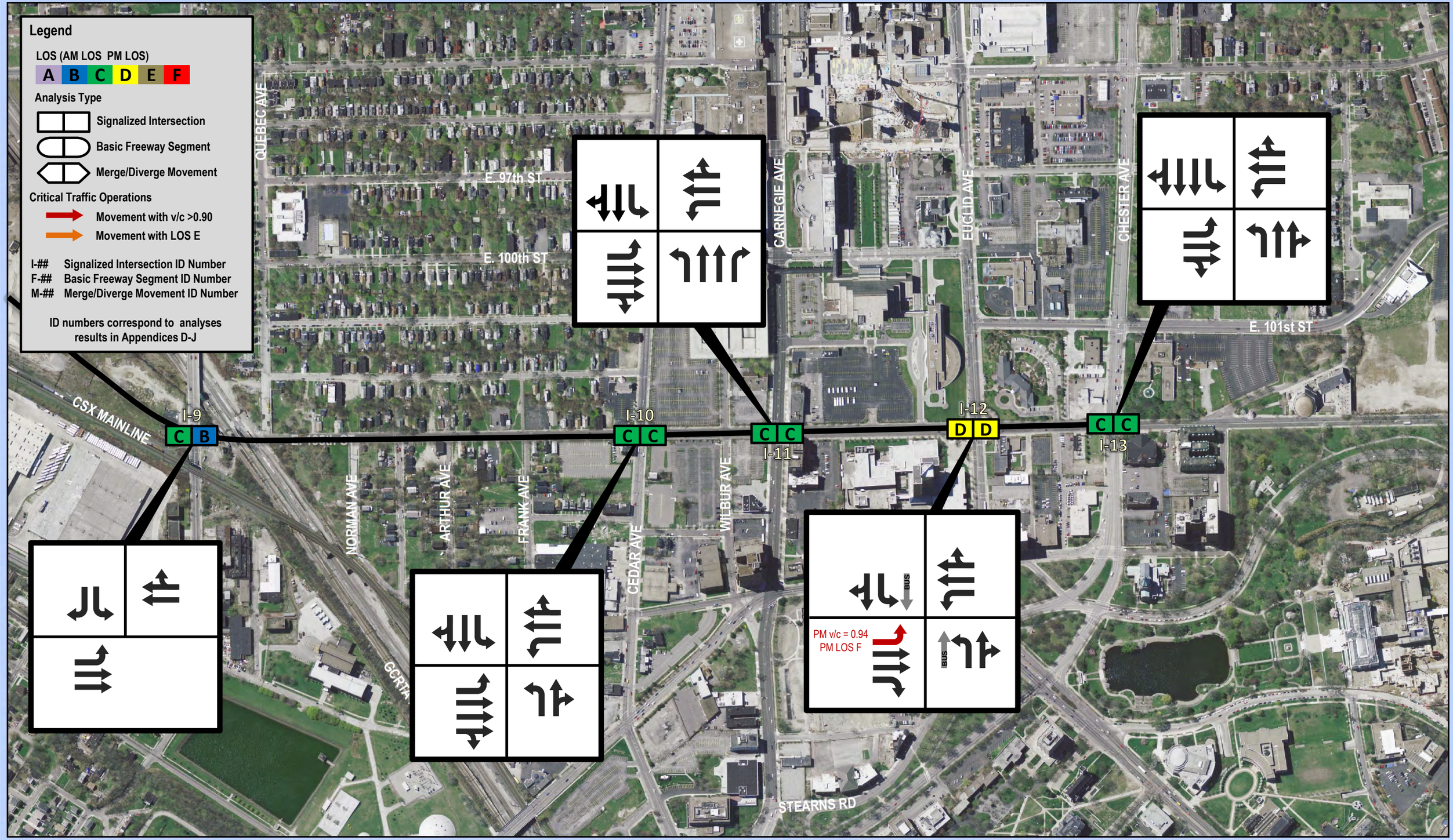
ID numbers correspond to analyses results in Appendices D-J



CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Exhibit 3b: Lane Use and Level of Service
HCS Results - Balanced Approach Delays
Build Network (Central Section)

NORTH
NOT TO SCALE



CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Exhibit 3c: Lane Use and Level of Service
HCS Results - Balanced Approach Delays
Build Network (East Section)

NORTH
NOT TO SCALE

Appendix B: Certified Traffic

OHIO DEPARTMENT OF TRANSPORTATION
CENTRAL OFFICE • 1980 WEST BROAD STREET • COLUMBUS, OH 43223
JOHN R. KASICH, GOVERNOR • JERRY WRAY, DIRECTOR

April 11, 2012

Matthew Wahl, P.E.
HNTB Ohio, Inc.
1100 Superior Avenue, Suite 1330
Cleveland, Ohio 44114

RE: CUY-Opportunity Corridor, PID 77333

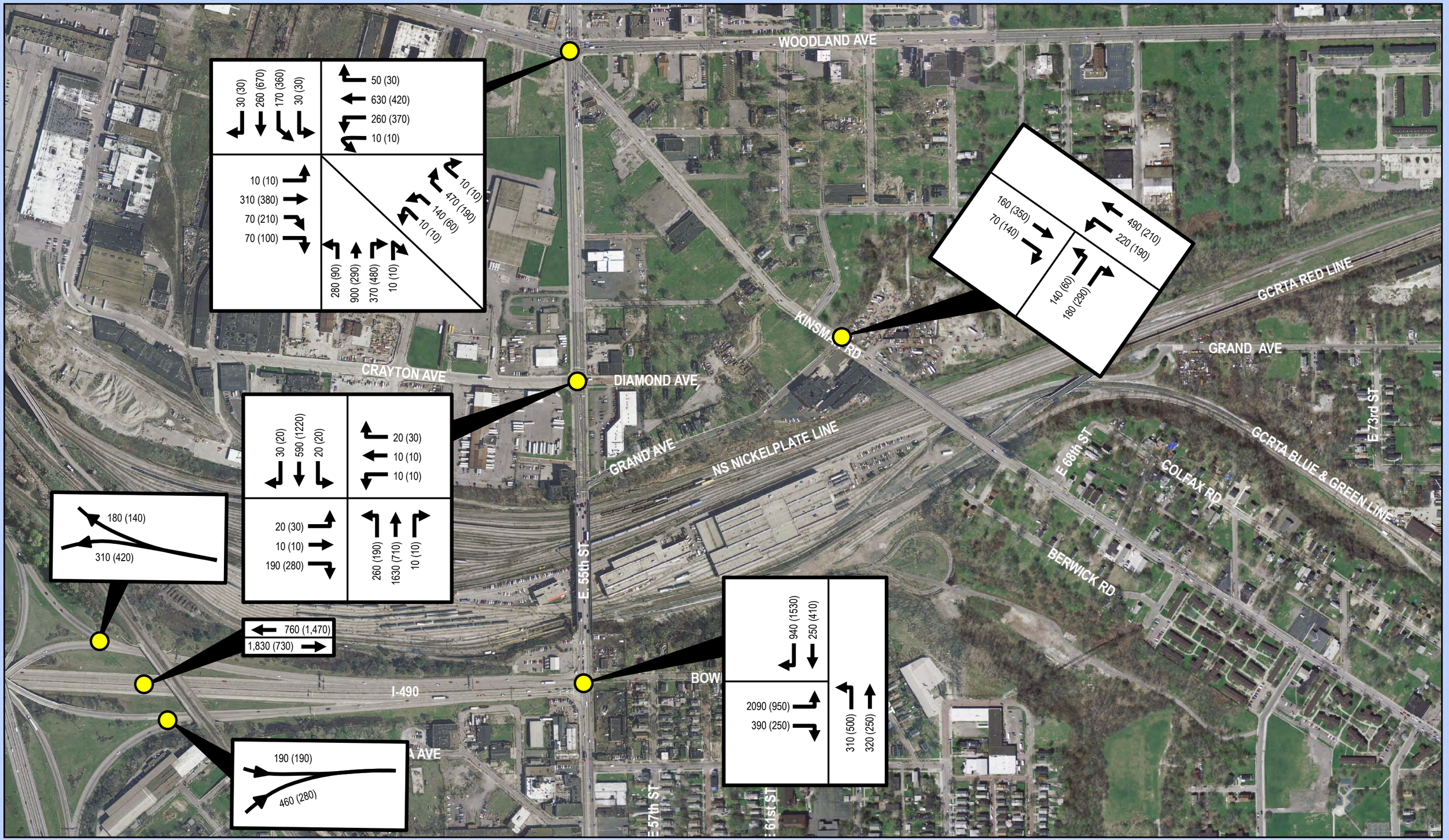
Mr. Wahl:

In reply to a request received February 7, 2012, the review of the submitted traffic forecast has been completed. The changes previously requested by this office have been addressed and the final plates submitted on April 11, 2012 are approved for use. If you have any questions, please contact me at (614) 752-5747 or at Joshua.Kieselbach@dot.state.oh.us.

Sincerely,

Joshua Kieselbach, P.E.
Modeling & Forecasting
Office of Statewide Planning & Research

c: M. Byram, OMP – File

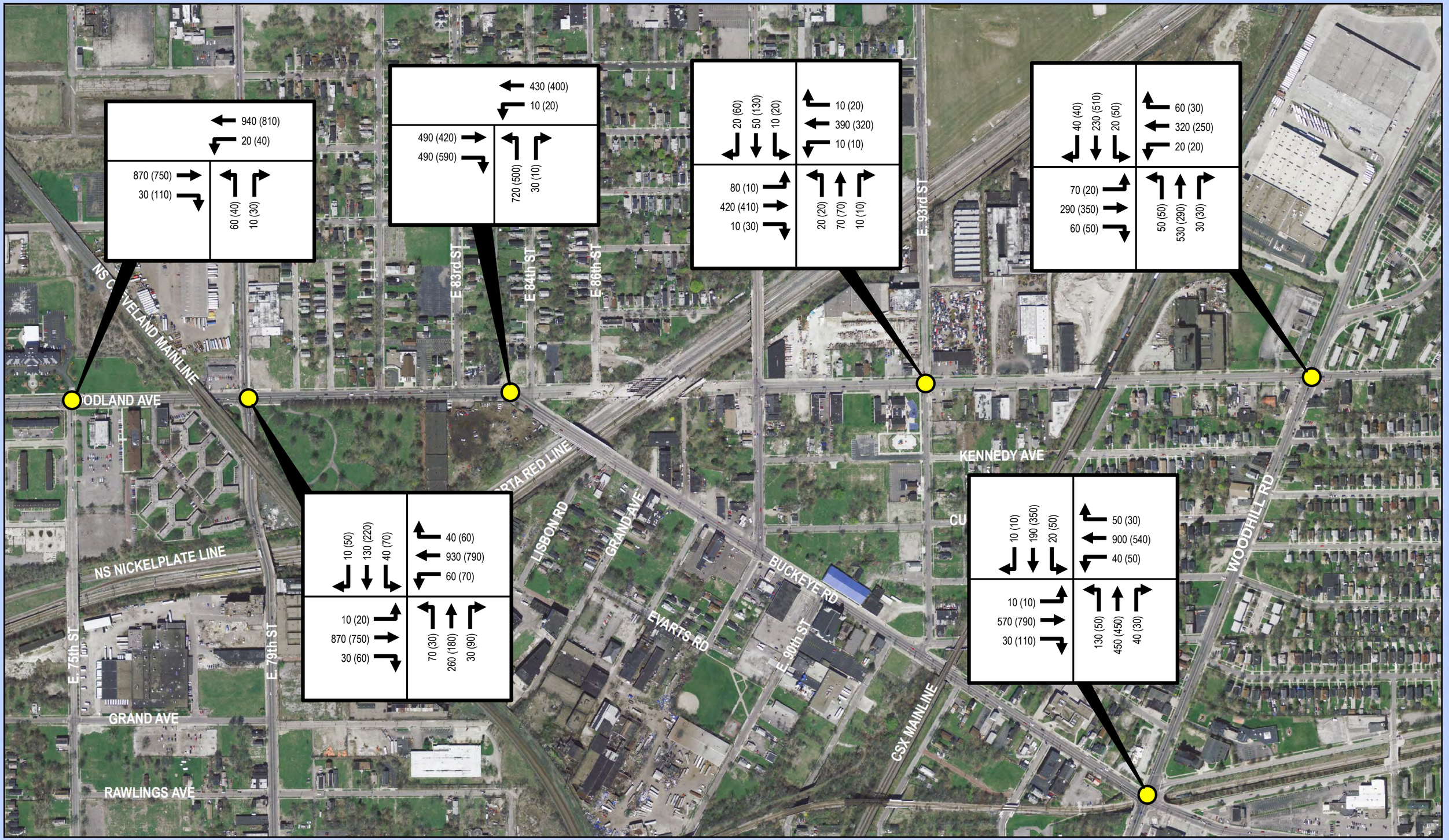


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (West Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

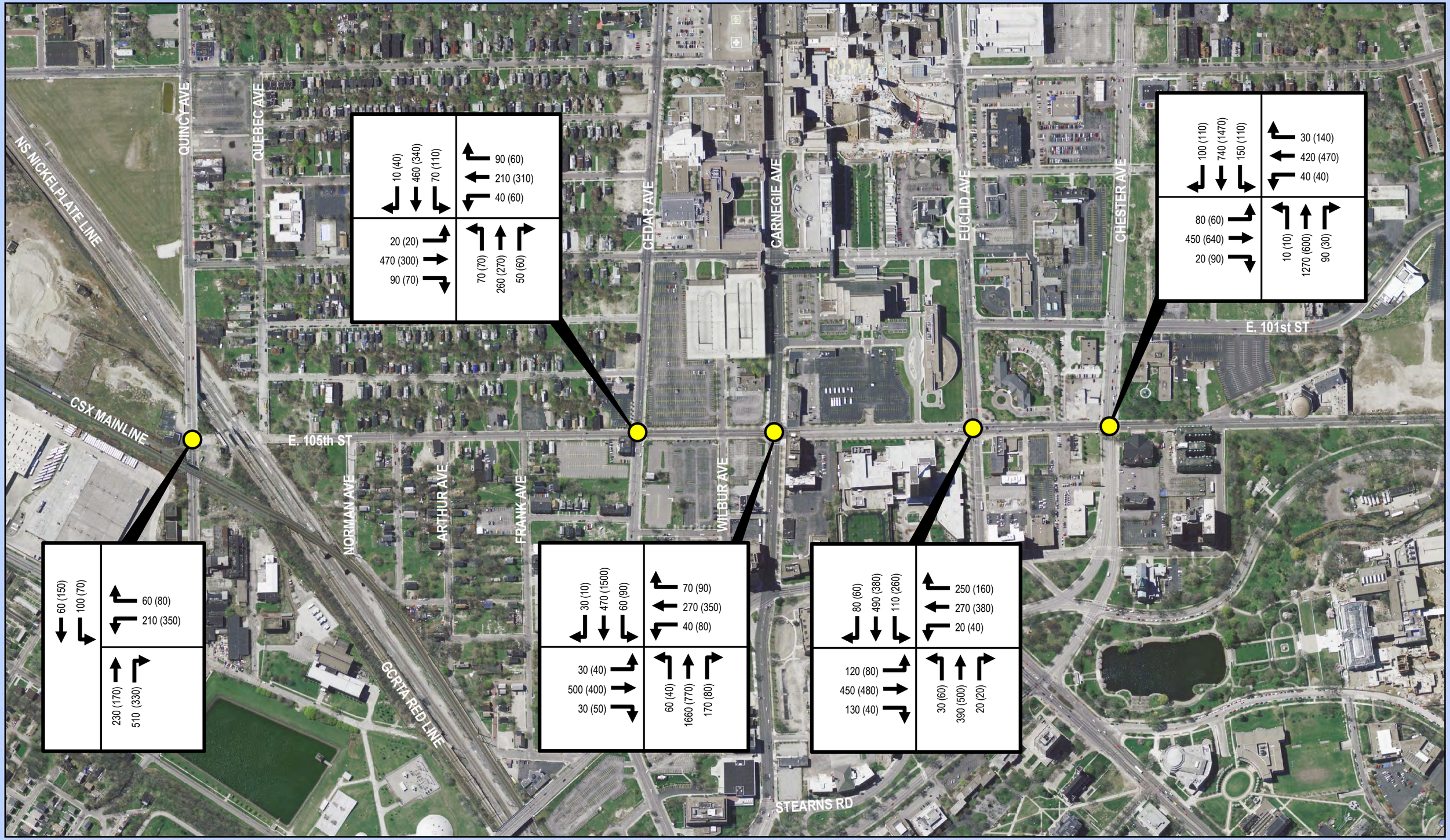


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (Central Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

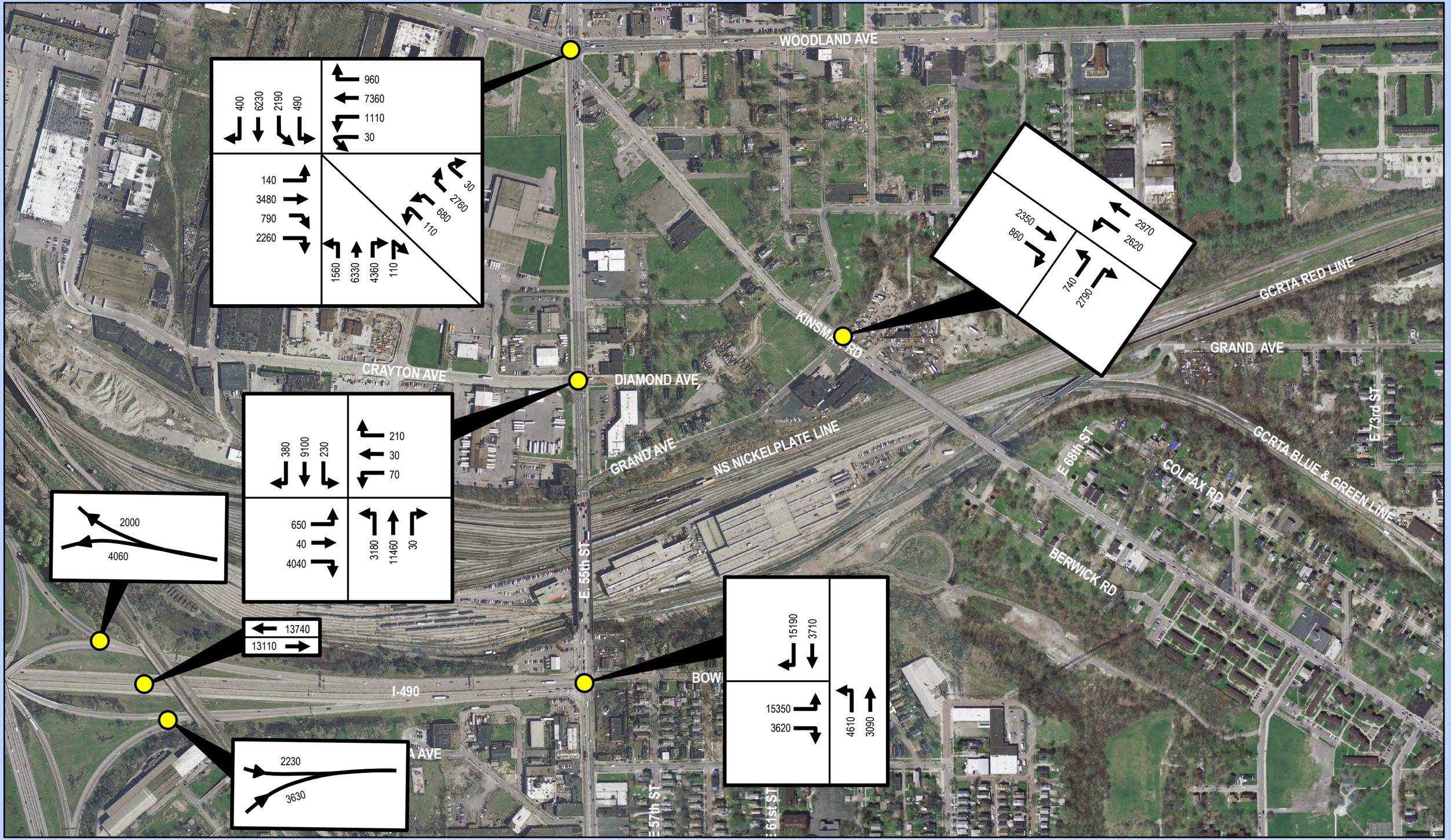


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (East Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

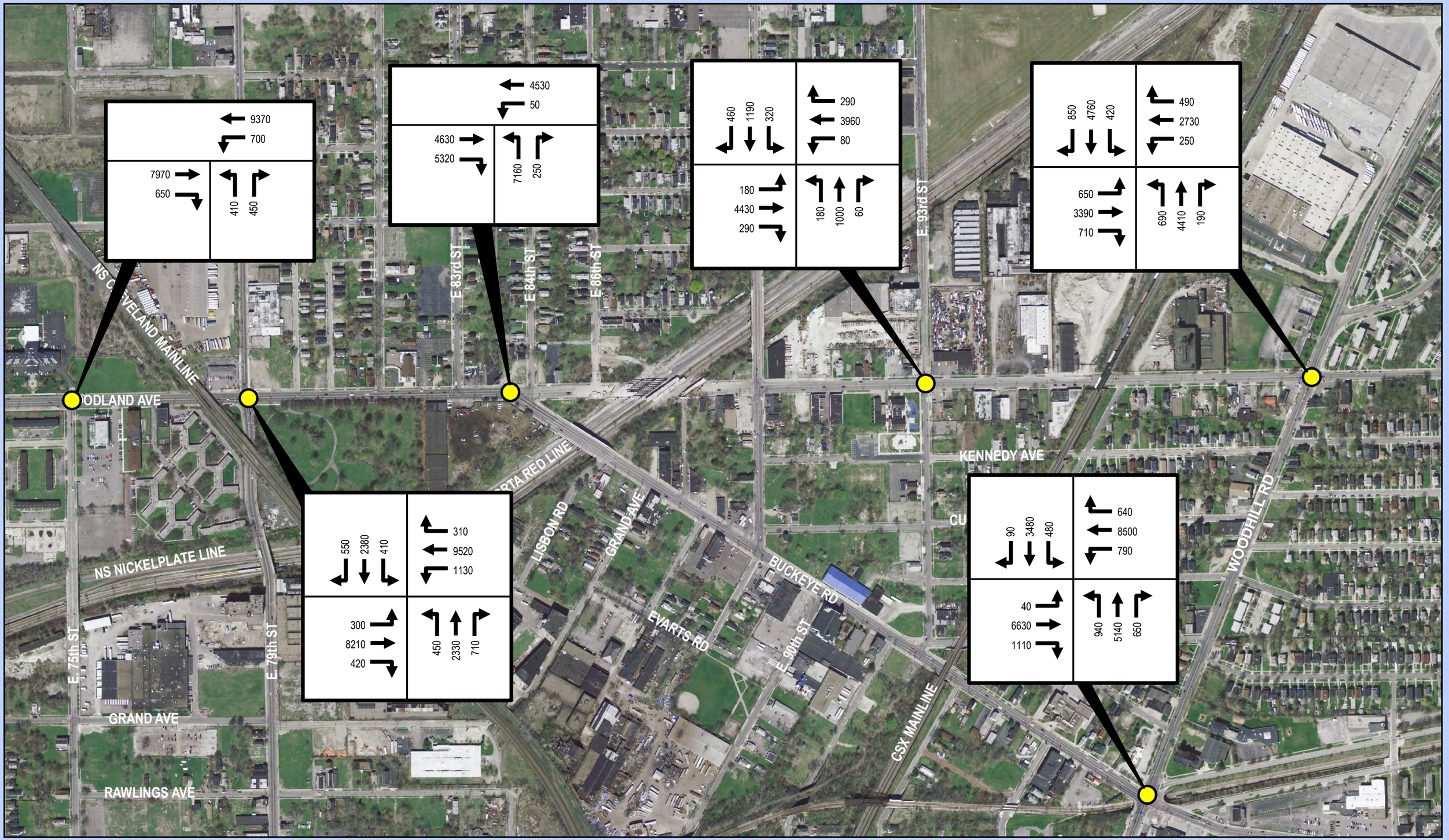


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (West Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012

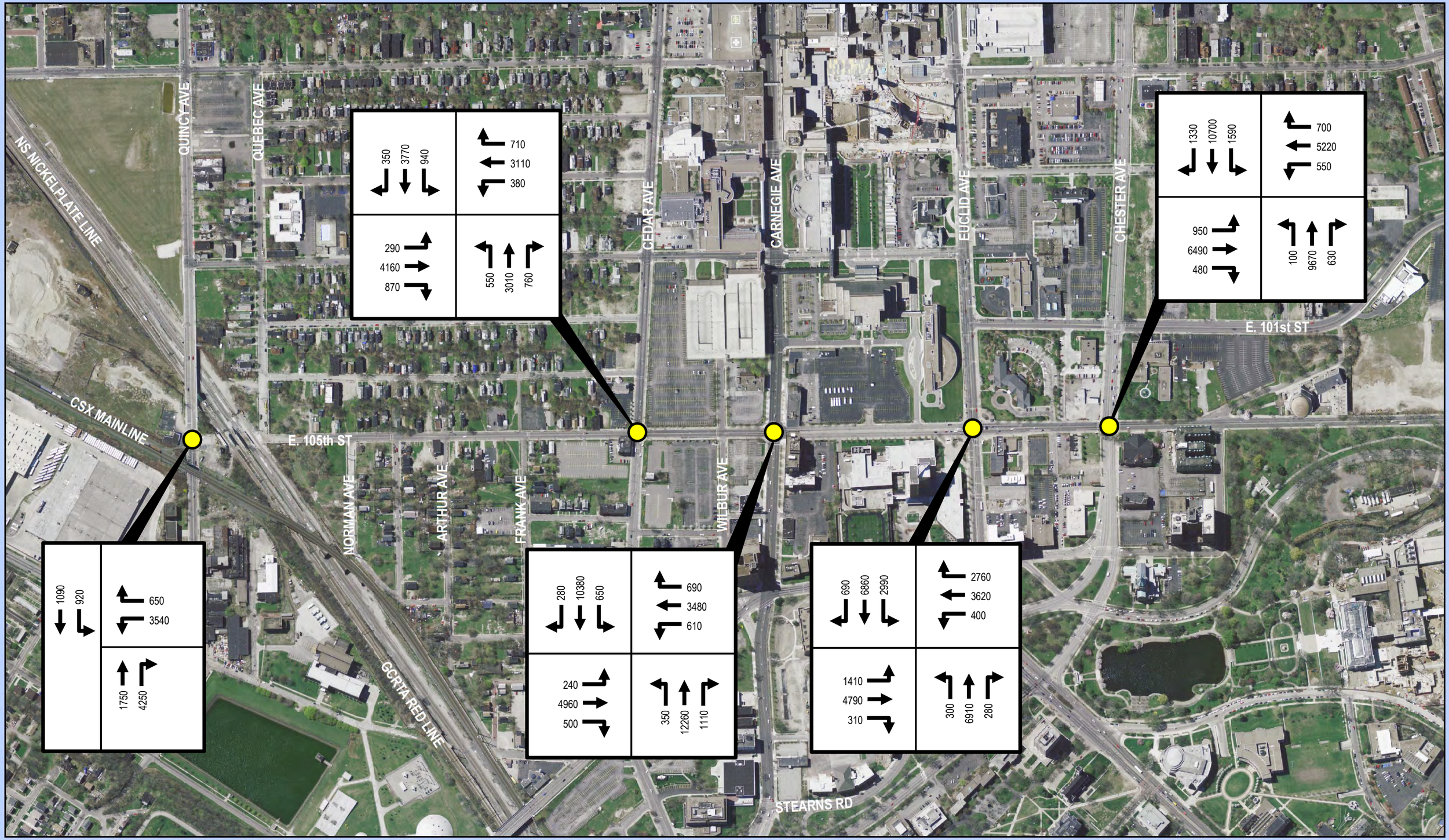


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (Central Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012

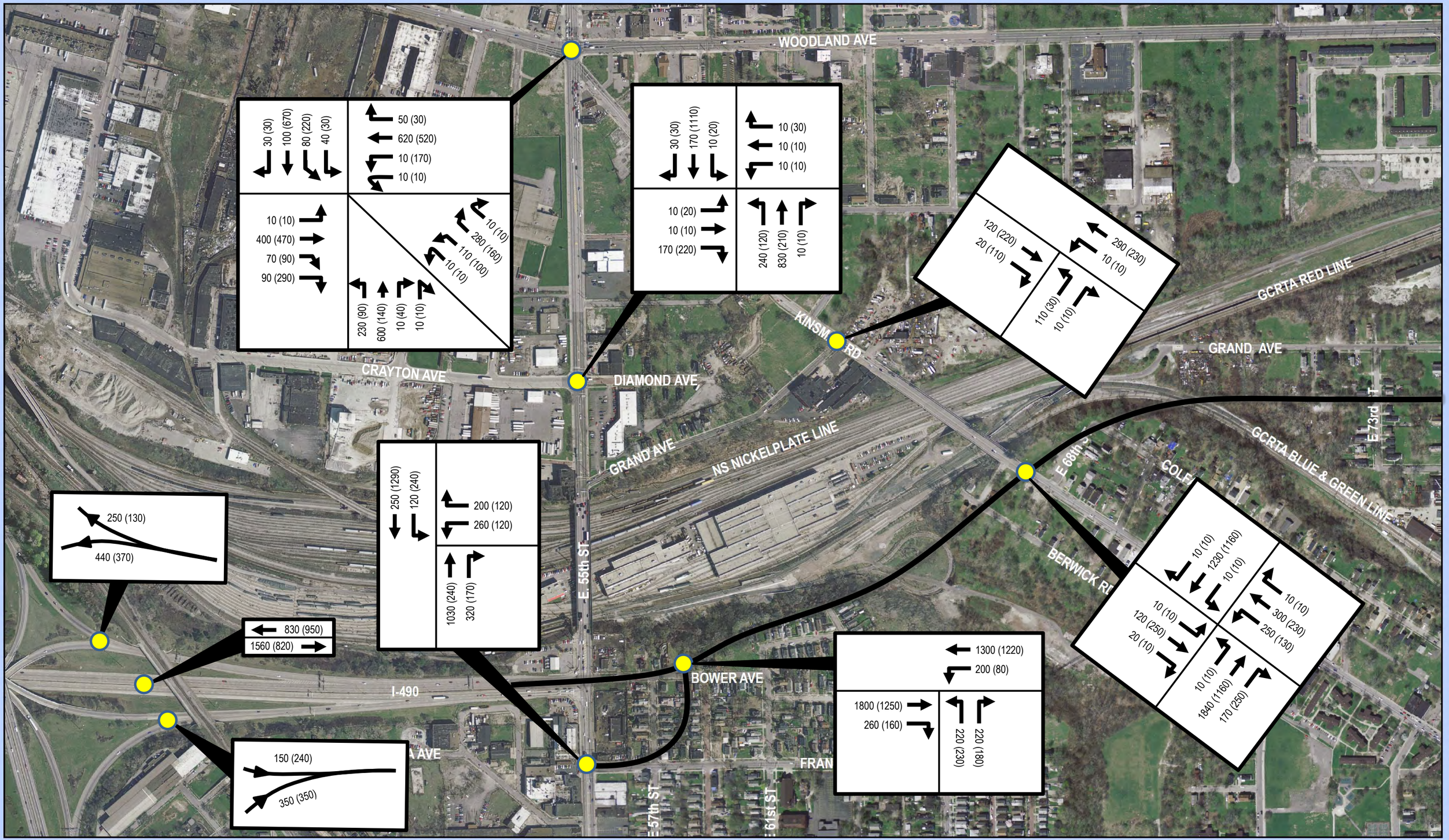


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
No Build Network (East Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012

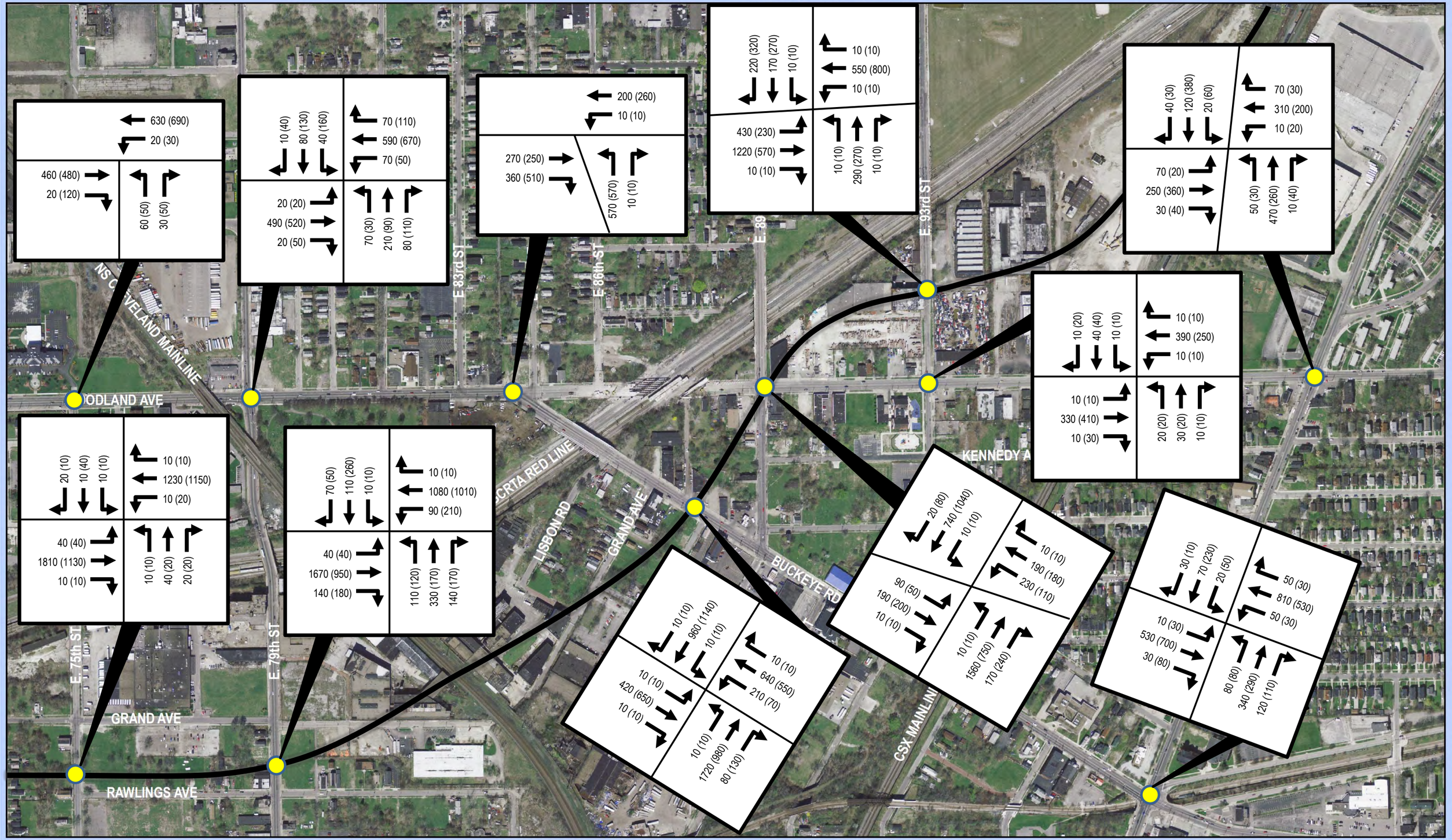


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (West Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

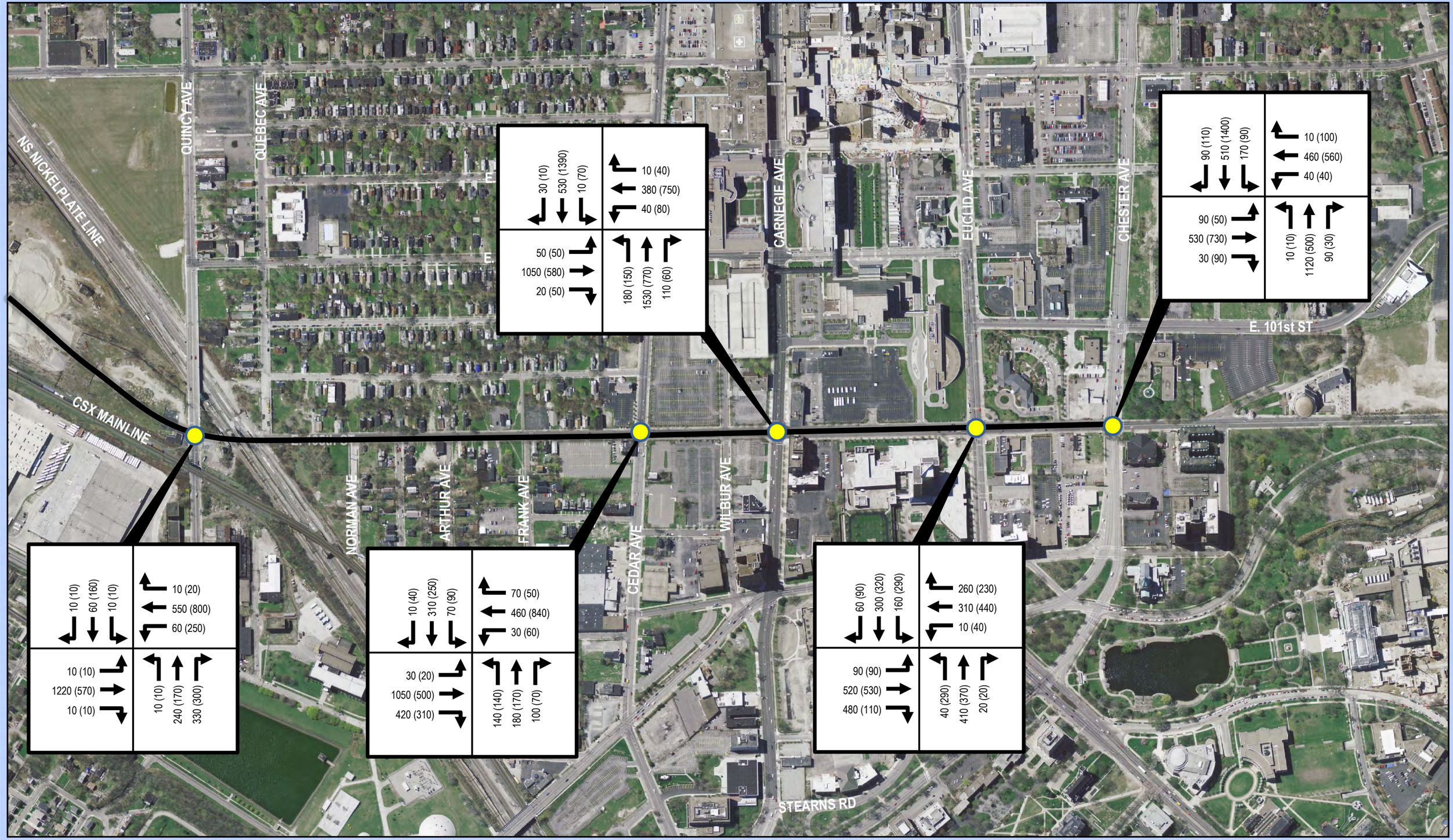


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (Central Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

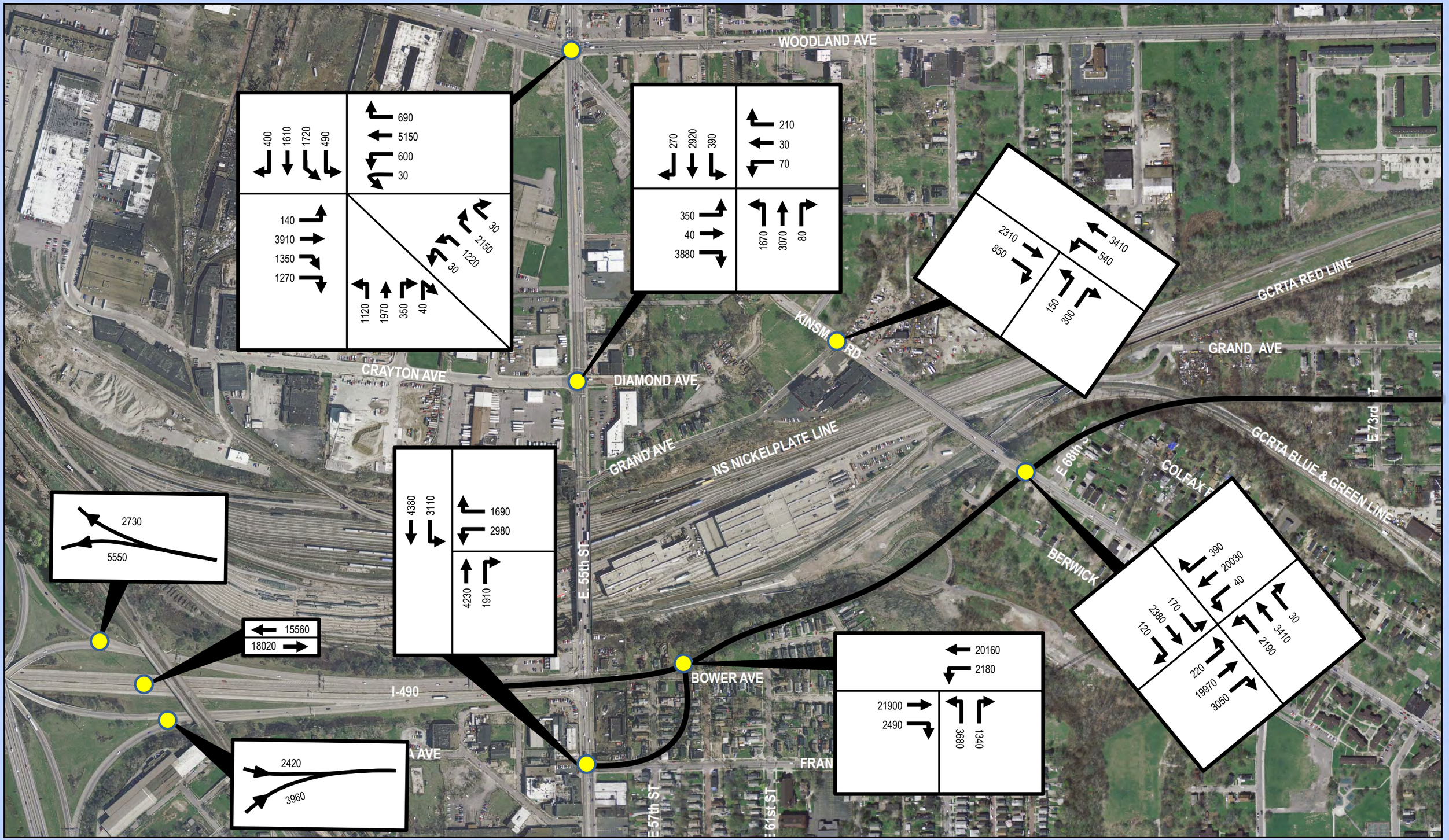


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (East Section)
AM (PM) Peak Hour Traffic

NORTH

Certified Traffic Request – April 11, 2012

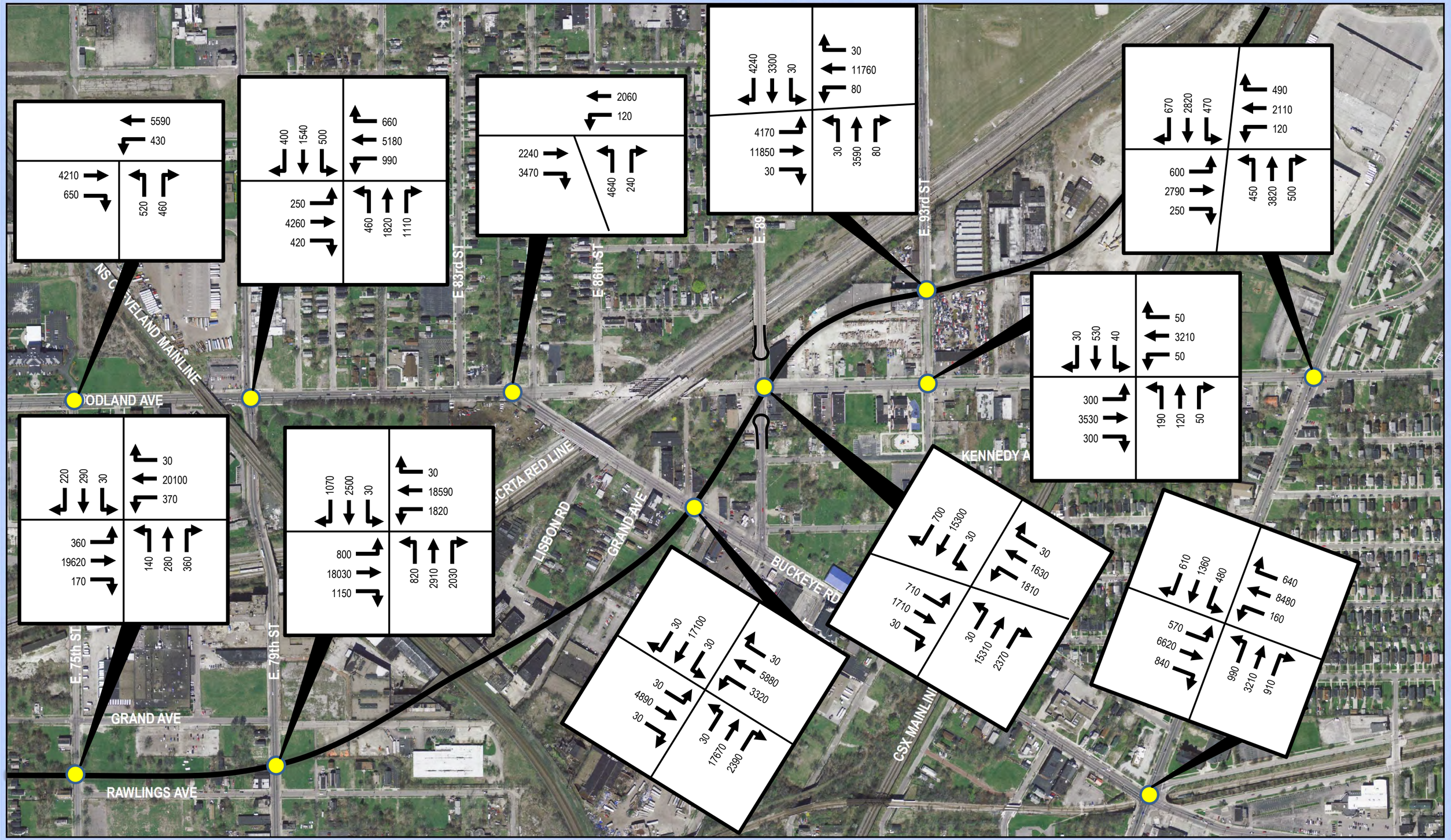


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (West Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012



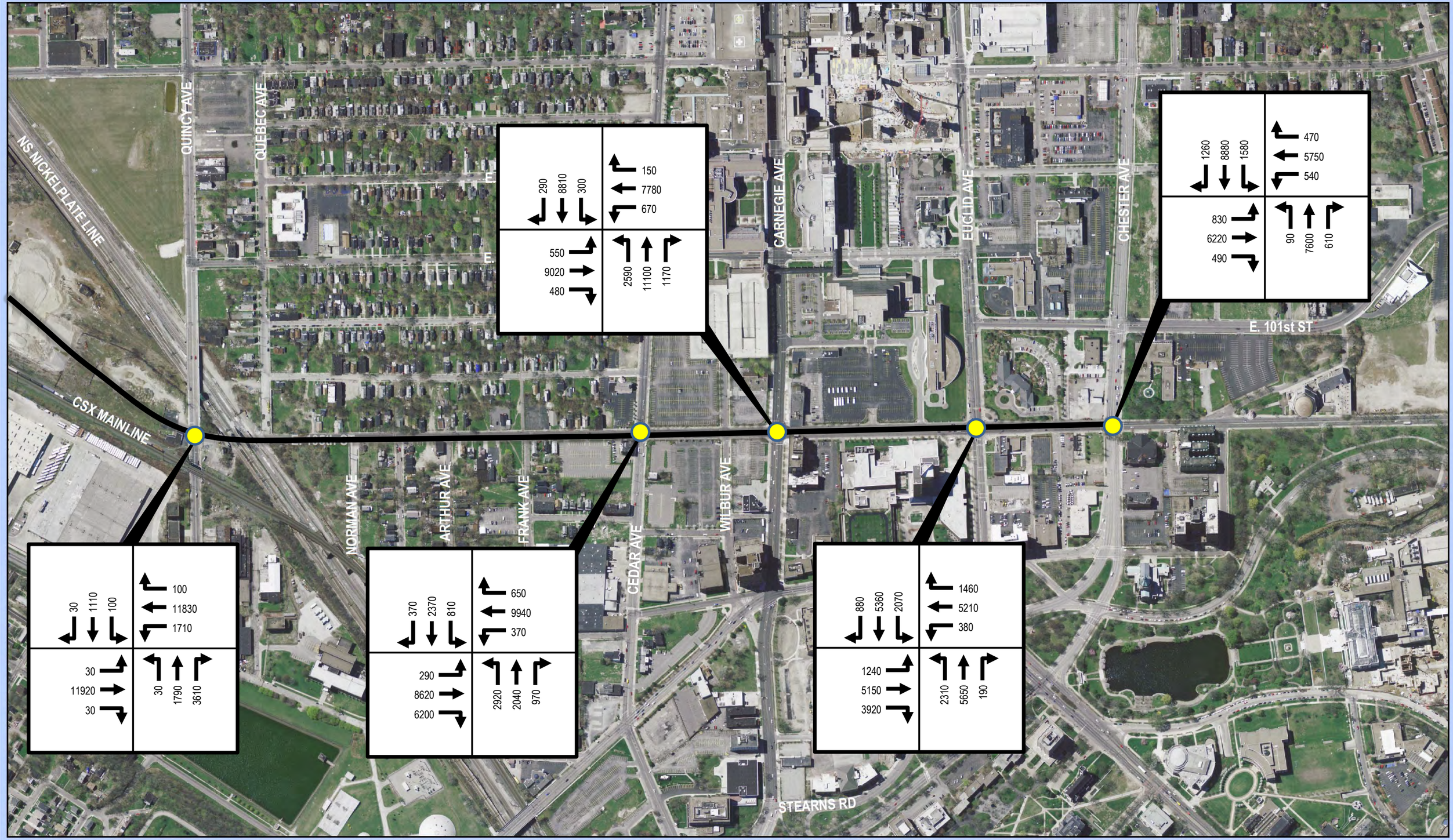
CLEVELAND OPPORTUNITY CORRIDOR

CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (Central Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012



CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (East Section)
ADT

NORTH

Certified Traffic Request – April 11, 2012

Traffic plates for the Opportunity Corridor Project (PID 77333) were certified by the Ohio Department of Transportation's Office of Technical Services on April 11, 2012. The certified traffic includes average daily traffic (ADT) volumes and AM and PM peak hour traffic volumes for the design year (2020) for the No Build and Build geometries.

Following traffic certification, geometric constraints were determined at the Boulevard's intersection with Quincy Avenue. A meeting with the City of Cleveland and the Ohio Department of Transportation (ODOT) was held on May 4, 2012 that resulted in agreement to close the eastern leg of Quincy Avenue. The certified traffic was manually rerouted to reflect revised traffic patterns due to this closure. The methodology for the traffic distribution is included within this document.

According to a select link analysis performed by the Northeast Ohio Areawide Coordinating Agency (NOACA), the majority of traffic using the existing east leg of Quincy Avenue travels to/from southeast of the study area. Based on this information, ADT and AM and PM peak hour turning movement traffic volumes were rerouted to use Buckeye Road and E. 93rd Street via Woodland Avenue. Details for each impacted movement at the E.105th Street/Quincy Avenue intersection are described in more detail below:

Westbound through movement

Traffic using Quincy Avenue from the east anticipated to continue through the intersection westbound is rerouted to use E. 93rd Street or Buckeye Road with the destination north of Quincy Avenue. Per the select link analysis, vehicles come from the south or southeast. Approximately half of the volume travels northbound on Buckeye Road and turns right onto the proposed boulevard. The rerouted traffic travels northbound along the Boulevard until it reaches Quincy Avenue where it is added to the left turn movement to travel west. The remaining half of the rerouted traffic travels north on Woodhill Road, west on Woodland Avenue, and north on E. 93rd Street. The traffic continues north through the intersection with the Boulevard towards Quincy Avenue.

Westbound to northbound movement

Traffic using Quincy Avenue from the east anticipated to turn right to head north on E. 105th Street is rerouted to use E. 93rd Street or Buckeye Road. Per the select link analysis, vehicles come from the south or southeast. Approximately half of the volume travels northbound on Buckeye Road and turns right onto the proposed Boulevard. The remaining half of the rerouted traffic travels north on Woodhill Road, west on Woodland Avenue, and north on E. 93rd Street. Volumes are added to the right turn movement at E. 93rd and the proposed Boulevard. The additional traffic from Buckeye Road and E. 93rd Street continues east on the boulevard and north on E. 105th Street.

Westbound to southbound movement

The Travel Demand Model (TDM) showed a volume of zero for this movement so the minimum volume (10 vehicles for AM and PM peak hour and 30 vehicles for ADT) was included in the certified traffic plates. Therefore, the volume shown in the certified traffic is not rerouted.

Eastbound through movement

Traffic using Quincy from the west anticipated to travel through the intersection is rerouted to use E. 93rd Street. This traffic is added to the southbound through movement at the E. 93rd Street

intersection with the Boulevard. At E. 93rd Street and Woodland Avenue this traffic turns left to travel south or southeast of the study area.

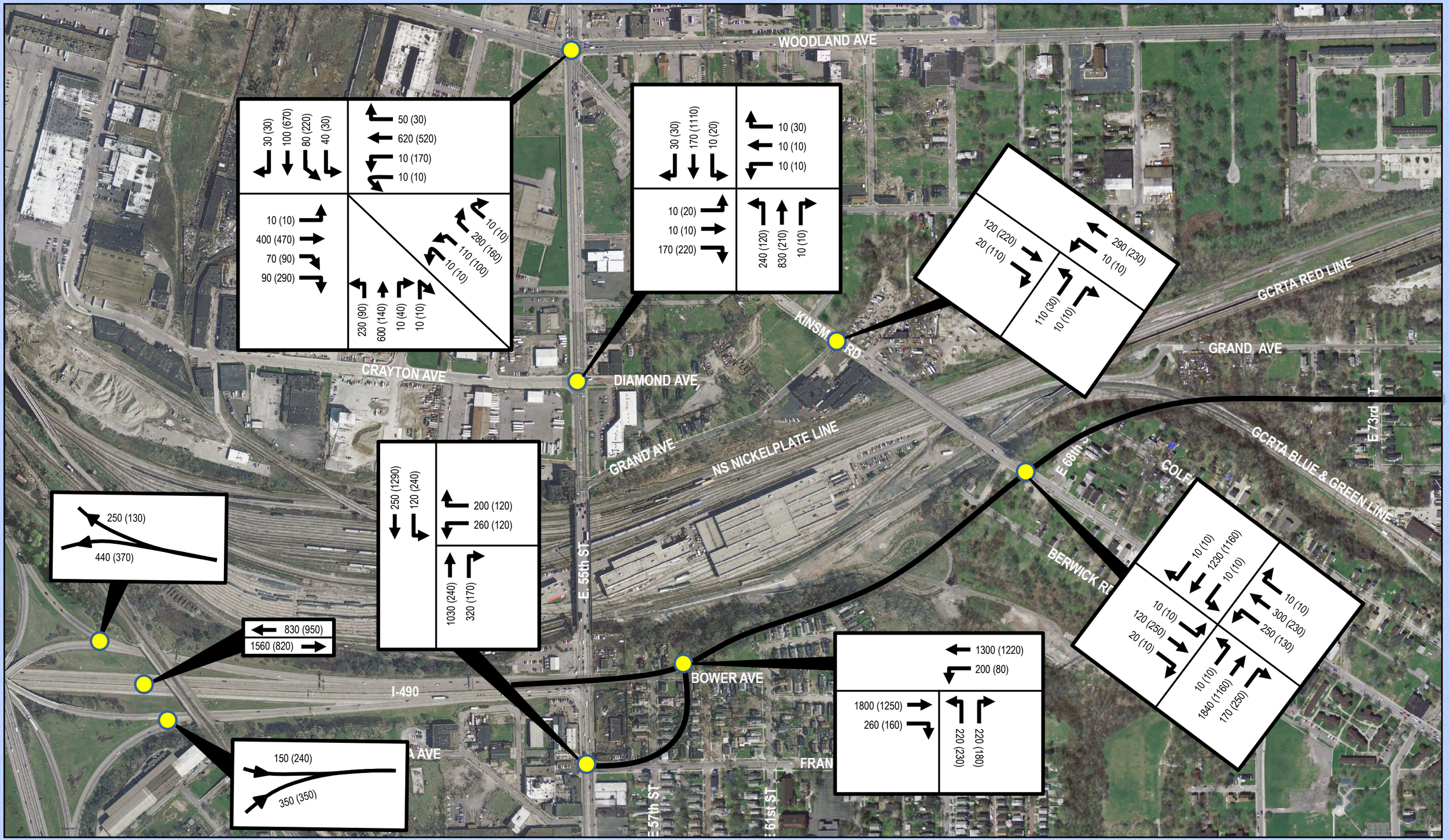
Northbound to eastbound movement

The TDM showed a volume of zero for this movement so the minimum volume (10 vehicles for AM and PM peak hour and 30 vehicles for ADT) was included in the certified traffic plates. Therefore, the volume shown in the certified traffic is not rerouted.

Southbound to eastbound movement

Traffic along E. 105th Street from the north anticipated to turn left at Quincy Avenue is rerouted to continue through on the Boulevard and access the east or southeast via E. 93rd Street or Buckeye Road. Approximately half of the volume turns left onto E. 93rd Street to travel south or southeast of the study area. The remaining half continues west along the proposed Boulevard until it reaches Buckeye Road, where it is added to the left turn movement to head south or southeast of the study area.

ADT and AM and PM peak hour turning movement traffic volumes were rerouted based on the traffic patterns described above.

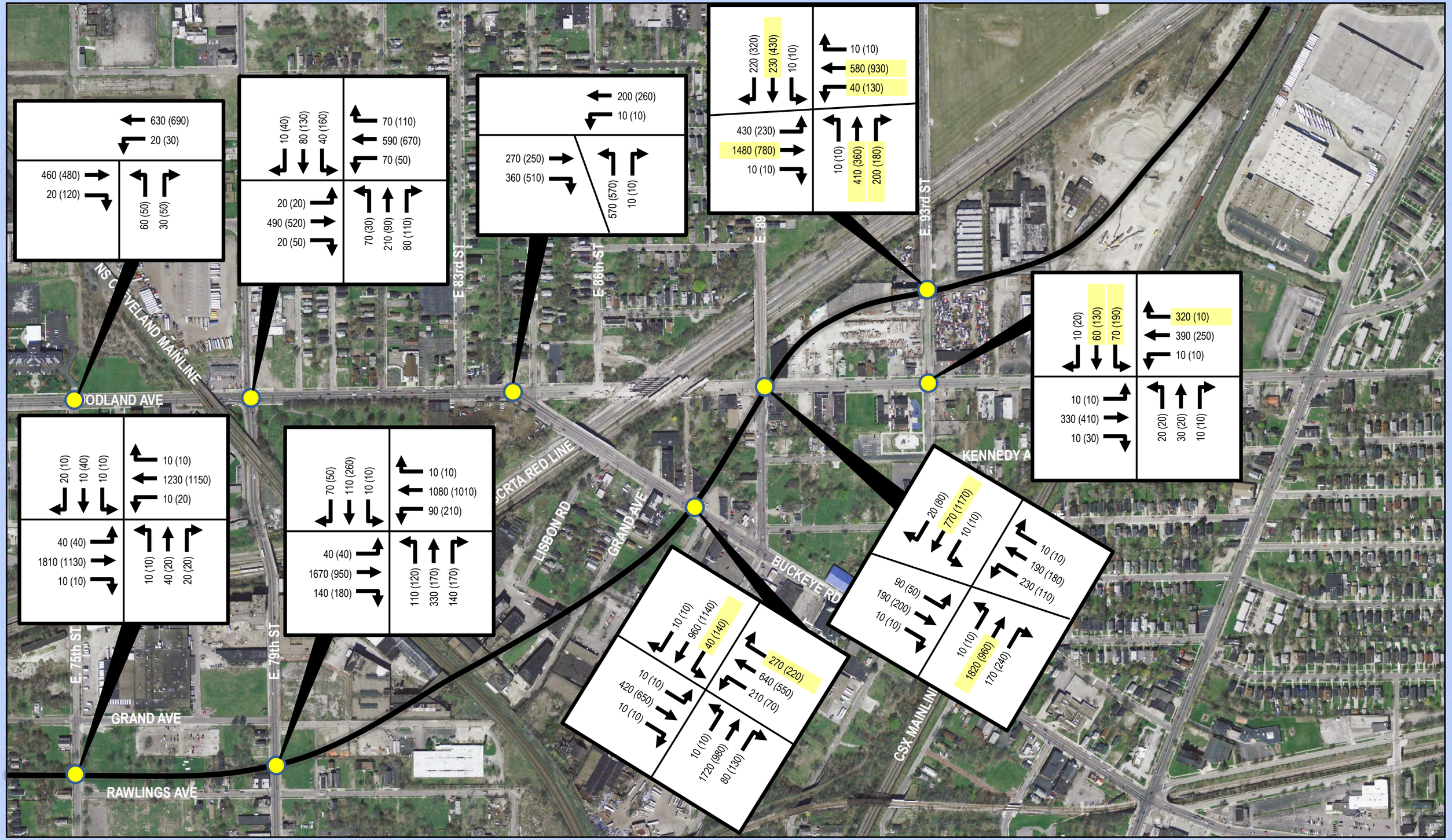


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (West Section) – Closure of East Leg at Quincy and Boulevard
AM (PM) Peak Hour Traffic

NORTH

Volume change due to closure of east leg at Quincy

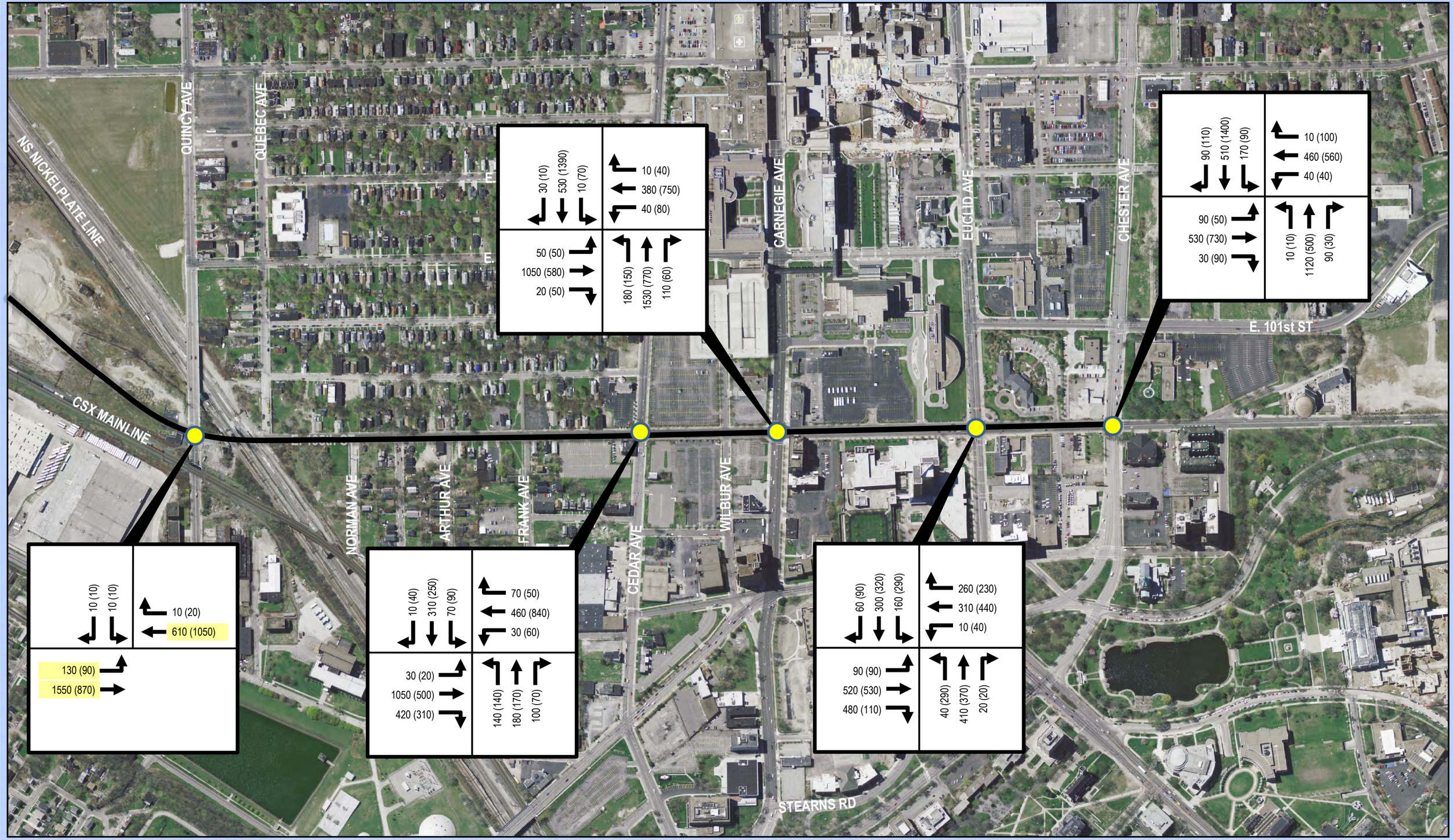


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (Central Section) – Closure of East Leg at Quincy and Boulevard
AM (PM) Peak Hour Traffic

NORTH

Volume change due to closure of east leg at Quincy

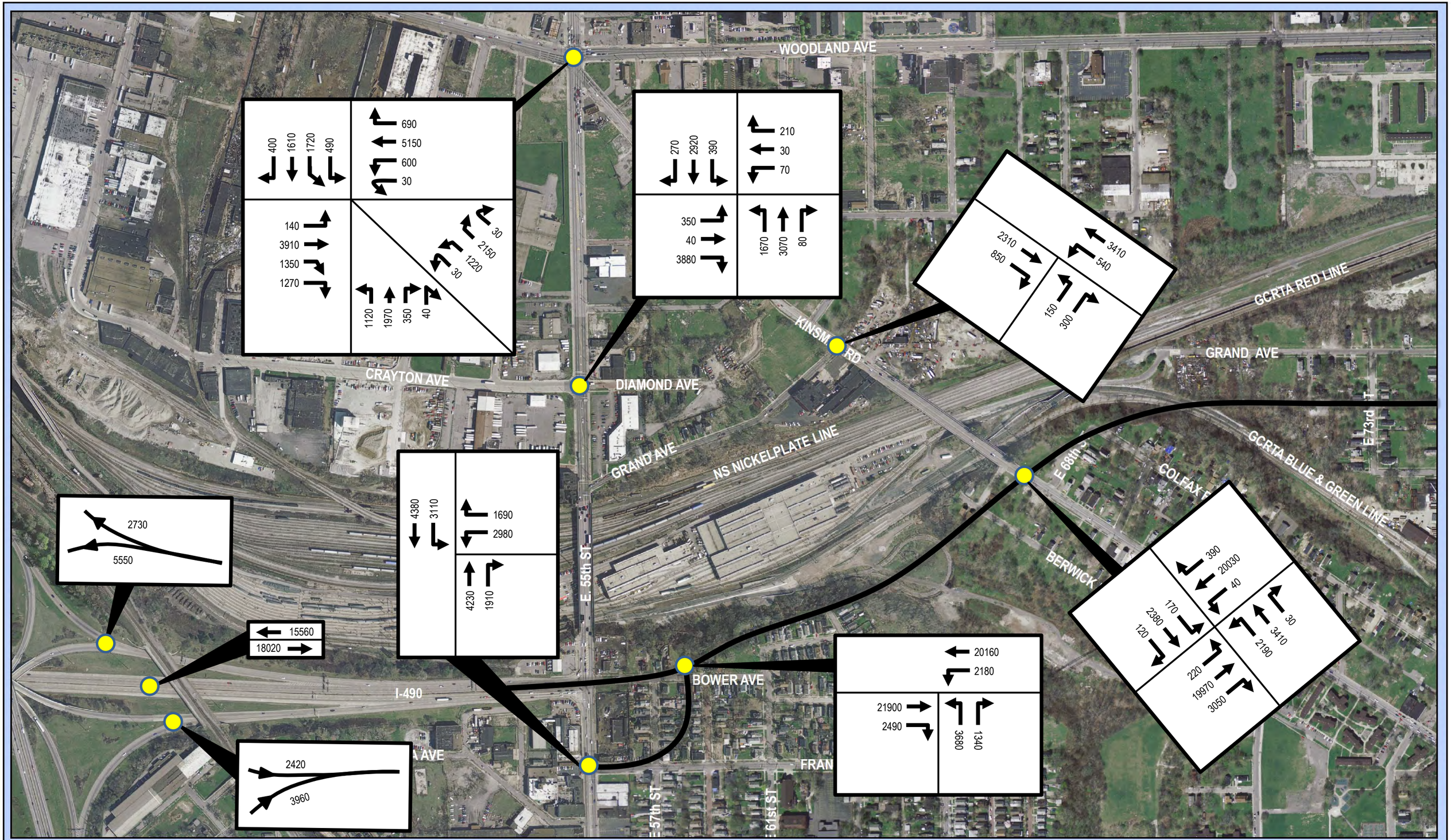


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (East Section) – Closure of East Leg at Quincy and Boulevard
AM (PM) Peak Hour Traffic

NORTH

Volume change due to closure of east leg at Quincy

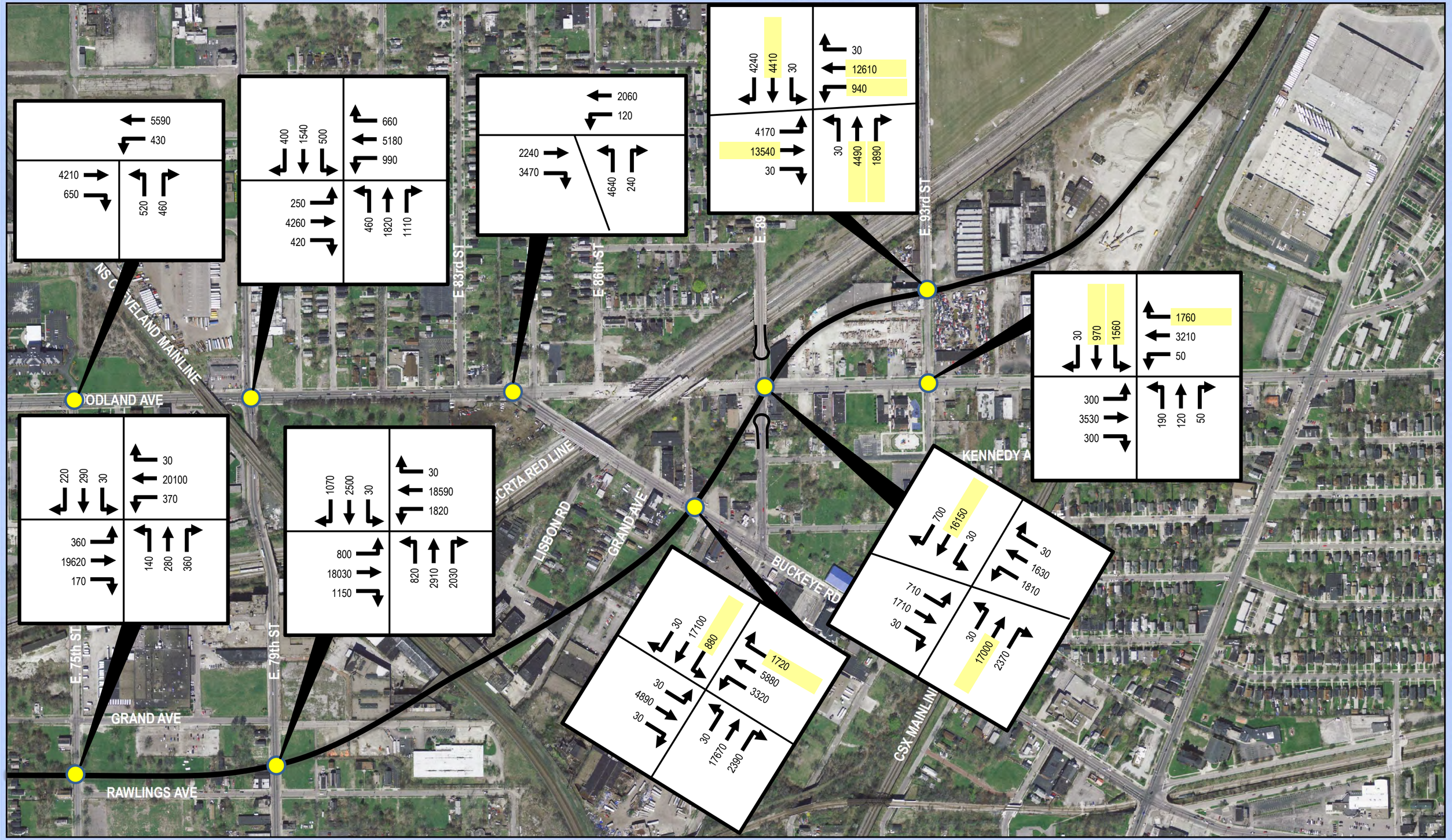


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (West Section) – Closure of East Leg at Quincy and Boulevard
ADT

NORTH

Volume change due to closure of east leg at Quincy

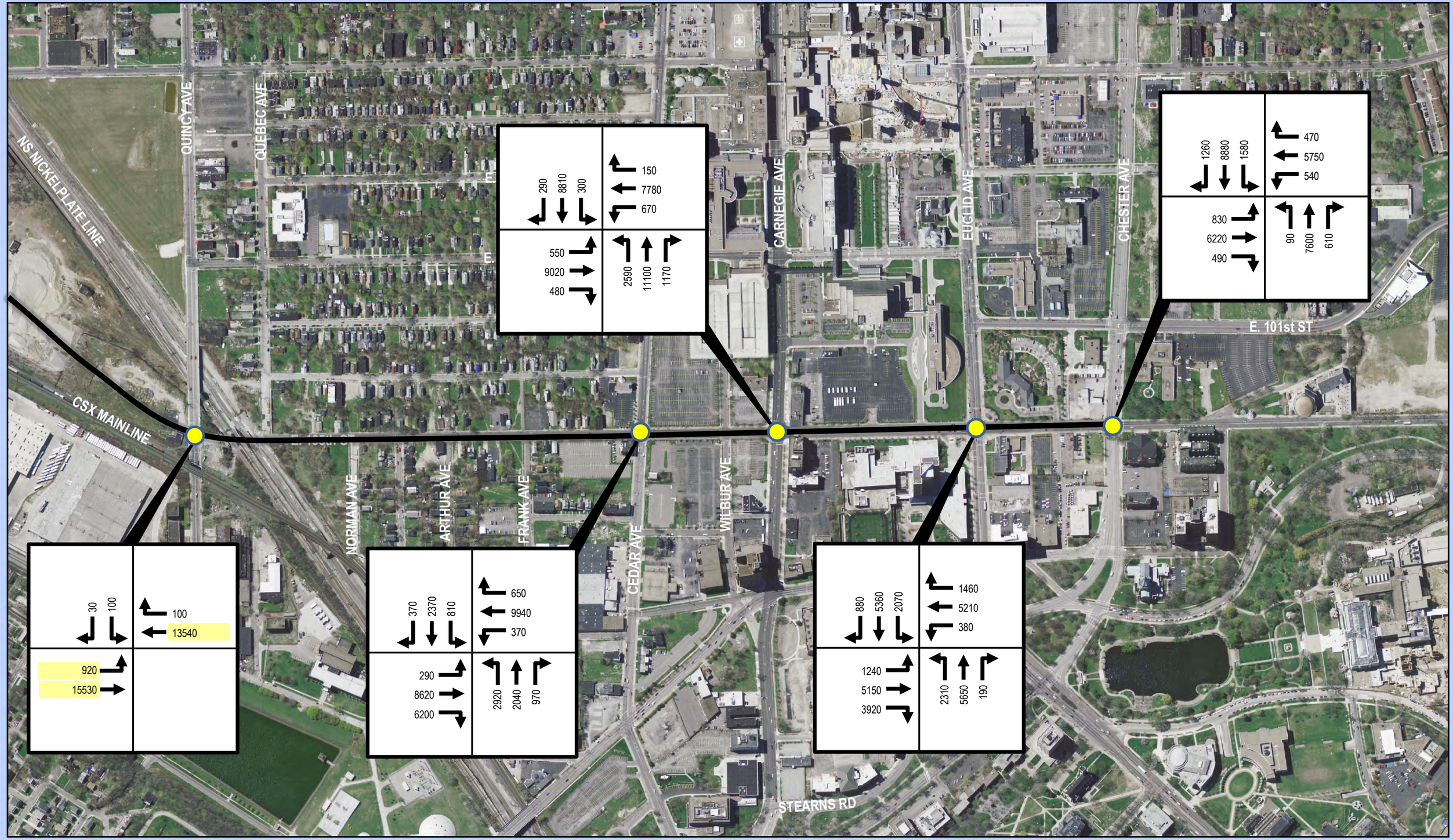


CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (Central Section) – Closure of East Leg at Quincy and Boulevard
ADT

NORTH

Volume change due to closure of east leg at Quincy



CUY-Opportunity Corridor
PID No. 77333
City of Cleveland, Cuyahoga County, Ohio

Opening Day/Design Year 2020
Build Network (East Section) – Closure of East Leg at Quincy and Boulevard
ADT

NORTH

Volume change due to closure of east leg at Quincy

Appendix C: Traffic Analysis Coordination Meeting Minutes & Correspondence

Opportunity Corridor

From: Valerie Webb
Sent: Friday, February 17, 2012 9:43 AM
To: Opportunity Corridor
Subject: FW: Clarification: Opportunity Corridor Step 7 Lane Use Revisions - Update

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From: Matt Wahl
Sent: Friday, February 17, 2012 9:40 AM
To: 'Cross, Andrew'; Boyer, Thomas
Cc: Dale.Schiavoni@dot.state.oh.us; Valerie Webb; Sarah Brown; Jodi Heflin; Adin McCann
Subject: RE: Clarification: Opportunity Corridor Step 7 Lane Use Revisions - Update

Thanks Andy. We are wrapping up the plan layouts of the roadways and hope to send out a PDF within a week. We are currently running AutoTurn templates across the corridor intersections to ensure that we have appropriate curb return radii utilized.

Look for something next week.

Thanks,

Matt

From: Cross, Andrew [mailto:ACross@city.cleveland.oh.us]
Sent: Friday, February 17, 2012 9:36 AM
To: Matt Wahl; Boyer, Thomas
Cc: Dale.Schiavoni@dot.state.oh.us
Subject: RE: Clarification: Opportunity Corridor Step 7 Lane Use Revisions - Update

Matt:

Thank you for the very quick and detailed update. I have only a few minor comments shown below in red. I apologize for the delayed reply.

Andrew R. Cross, P.E., PTOE
Traffic Engineer

City of Cleveland
Division of Traffic Engineering
601 Lakeside Avenue, Room 25
Cleveland, OH 44114
Phone: (216) 664-3197
Fax: (216) 664-3167
Email: across@city.cleveland.oh.us

From: Matt Wahl [mailto:MWAHL@HNTB.com]
Sent: Wednesday, February 08, 2012 8:14 AM
To: Boyer, Thomas
Cc: Cross, Andrew
Subject: RE: Clarification: Opportunity Corridor Step 7 Lane Use Revisions - Update

Tom,

Sorry for the confusion – we are recommending maintaining two lanes in each direction plus the left turn lane. Each left turn lane length will be shortened - northbound to avoid the church on the south (west) side of Kinsman. The southbound turn lane will be very short to limit the widening to the southern of the two RTA bridges – according to NOACA's model no one would make this turning movement – which generally makes sense since you would stay on Woodland to access points east if coming from the north. We figured it best to leave a minimal length of turn lane in case someone does make the turn rather than restricting the movement altogether – since we will already need to offset the thru lanes for the NB left lane.

Let me know if this helps. In the near future we will have updated plan layouts to illustrate this narrative – just not ready yet.

Thanks,

Matt

From: Boyer, Thomas [mailto:tboyer@city.cleveland.oh.us]
Sent: Wednesday, February 08, 2012 7:53 AM
To: Matt Wahl
Cc: Cross, Andrew
Subject: Clarification: Opportunity Corridor Step 7 Lane Use Revisions - Update

Matt,

- Kinsman Road/OC Blvd – we found that maintaining the two thru lanes in each direction on Kinsman with a single left turn lane provides improved signal operation. If we limit the length of the turn lanes and shift the widening slightly further to the west side we should be able to avoid impacts to the church and the residential units. We will need to widen a bridge over RTA. We recommend maintain the two thru lane configuration along Kinsman Road.

Clarification: the two thru lanes with a single left turn lane improves signal operation but since the thru lane requires the RTA bridge to be widened this left turn lane will not be recommended. Is this interpretation correct?

Thomas P. Boyer, P.E.
Design Section Chief
Div. Engineering & Construction
601 Lakeside Room 518
Cleveland, Ohio 44114
216.664.2379

From: Matt Wahl [mailto:MWAHL@HNTB.com]
Sent: Tuesday, February 07, 2012 7:26 PM
To: Cross, Andrew; Boyer, Thomas; David Short; John Motl; Dale.Schiavoni@dot.state.oh.us
Cc: Valerie Webb; Sarah Brown; Joshua Epperson; Matthew Regan
Subject: Opportunity Corridor Step 7 Lane Use Revisions - Update

Andy and Tom,

Since our meeting at city hall last month we have performed a lot of coordination, refined the capacity analysis and been evaluating the impacts affiliated with potential lane use revisions along the corridor. I wanted to provide you with a semi-brief summary of activities and their results:

- Geometrics/Traffic Analysis coordination meeting with ODOT Central Office – we met with Roadway Services staff. Part of the discussion was about the analysis methods and goals for the traffic modeling. It was determined that we will utilize both our Synchro model for the corridor operations, but also look at each signalized intersection using HCS. Volume to Capacity ratios under 0.9 are the desire for all of the movements,

but will not be a specific requirement – like discussed at the city meeting we will examine what it takes to keep the V/C's around or under 0.9, but recognize that the impacts may exceed the benefits. Also discussed at the meeting was the need to maintain a 60mph design speed along I-490 up to the new intersection with the quadrant roadway. Based on this we are in the process of reevaluating our alignment and typical section elements between E55th Street and the Kingsbury Run valley.

- Improvements to V/C's at specific locations – at the meeting with you at city hall specific intersections were to be further studied to see what it would take to lower the V/C ratio's. Below is a summary of this work and the affiliated impacts.
    - Kinsman Road/OC Blvd – we found that maintaining the two thru lanes in each direction on Kinsman with a single left turn lane provides improved signal operation. If we limit the length of the turn lanes and shift the widening slightly further to the west side we should be able to avoid impacts to the church and the residential units. We will need to widen a bridge over RTA. We recommend maintain the two thru lane configuration along Kinsman Road.
    - E79th/OC Blvd – within HCS we were able to improve the traffic operation at this location without additional lanes from what was shown at the meeting. This does include an EB right turn lane onto E79th.
    - Buckeye/OC Blvd - within HCS we were able to improve the traffic operation at this location without additional lanes from what was shown at the meeting. This does include an EB right turn lane onto Buckeye.
    - Woodland/OC Blvd – it was requested that we study adding an EB right turn lane onto Woodland from the boulevard –Within HCS we can get this intersection to operate with V/C's under 0.9. Adding the turn lane did very little to improve operations, and would increase pedestrian crossing distances – an undesirable condition due to the intersection skew and proximity to the recreation center. Based on the above we do not recommend adding the turn lane.
    - E93rd/OC Blvd – per the discussions at the meeting we added a SB right turn lane from E93rd to the boulevard. This lane will be short in length to avoid impacts/widening to the E93rd Street bridge over NS and RTA.
    - Quincy/E105th – within HCS we were able to get acceptable V/C's using dedicated lefts and shared thru/right lanes on Quincy – this can be accomplished within the existing pavement widths – we have not performed profile analysis yet to determine if we can make things fit vertically however – this defers "atomic option 1" of disconnecting the east leg as a future decision.
    - E105th Corridor from the NB Cedar Approach to Euclid – we were asked to study adding either right turn lanes in the NB direction to each intersection or to add a third NB lane that would accommodate thru and right turn movements. The concern was whether the model was accurately estimating the traffic volumes coming from the heights. The desire was to lower some of the V/C's at these locations while also providing extra capacity in case the volumes were low. In conjunction with this analysis we added 5 seconds of "all red time" to the Euclid signal to replicate the bus only jump phase. – in general we found more benefit to adding the third northbound thru/right turn lanes in comparison to individual right turn only lanes. V/C's and approach delays were reduced. At Carnegie we would still have V/C's of 0.92 for the EB T/R movement in the PM. Euclid still has high delays and a failing NB left movement however other improvements were realized by adding the lane. Upon completing this analysis we looked to see if the lane could be added without impacting additional buildings along the corridor. We determined that it appears feasible to snake the widened pavement between the existing buildings. Overall we feel that the third NB lane will improve traffic operations along the corridor without greatly increasing impacts. We do have some concerns with pedestrian mobility across the widened roadway (6 lanes versus 5 lanes). I'm sure we will get many different opinions to this regard. Since the 6 lane section would give us the maximum environmental footprint we are going to proceed with this arrangement at this time. If the city ultimately decides to retain the 5 lane section it would lessen the impacts.

Matt – you are correct that the additional lane increases the intersection width. There is a balancing act of trying to provide adequate capacity while minimizing the roadway cross-section. I believe you have been very thorough in your capacity analysis to this point. You can demonstrate that the x-section has been minimized. I remember that an early proposal called for a seven lane roadway for about half the length of the corridor and a five/six lane section elsewhere. You've reduced much of the roadway to five lanes and added turn lanes only where shown necessary.

I've always been concerned that this roadway would be so popular it would be at capacity on opening day. And I've pushed for more capacity to avoid this problem. The E. 105th St. corridor has always been a big worry for us between Cedar and Chester. You've taken a detailed look at our concerns, and I'm appreciative of that. Adding one lane may be a net "wash" in terms of the pedestrian crossing experience anyway. Inadequate capacity would force us to extend cycle lengths to clear the queues – and that would likely increase the time pedestrians would have to wait for a walk indication.

- Chester/E105th – in both Synchro and HCS were are able to get this intersection to achieve acceptable V/C's and LOS utilizing a 6-lane segment while converting the inside WB thru lane into a left hand turn lane.

After you have had a chance to digest all of this information, let me know if you see anything that concerns you. We are on a very aggressive schedule so I wanted to get the results of our recent efforts in from of you without needing to wait for the plan work to catch up. Feel free to call me with any questions. Once plans are ready we will schedule a meeting to discuss.

Thanks,

Matt

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Project Name
CUY – Opportunity Corridor
(PID 77333)

HNTB Project #
39853

Purpose of Meeting
IR 490 Terminus at E55th St
Geometrics, IMS discussion

Date of Meeting
January 30, 2012

Location

ODOT Central Office
ODOT District 12 via conference call

Time
10:30 am – 11:30 am

Participants
See Attached

MEETING MINUTES

- **Introductions**
  - Attendees in Columbus and Cleveland introduced themselves.
- **Overview of Recommended Preferred Alternative near I-490**
  - Matt Wahl of HNTB provided an overview of the preferred alternative for the project. The new boulevard will be posted at 35 mph and designed at 40 mph. IR 490 has a 60 mph design speed.
  - The primary purpose of the meeting is to determine how far to extend the limited access right of way from IR 490, identify where to transition from a 60 mph to a 40 mph design speed, discuss MOT options, and identify Interchange Modification Study (IMS) requirements.
- **Interstate - Boulevard Transition of Functional Classification and Speed**
  - The limited access right of way (L/A-R/W) is typically extended to the first intersection after the freeway ends. For this project, it should be extended to the first new intersection – the quadrant roadway – to preclude driveways, etc.
  - The 60 mph design speed should be carried all the way to the first intersection. There is not sufficient distance to transition to lower speeds within the interchange area. The transition to the lower design speed should occur after the intersection and can be achieved with the help of the median, curbs, landscaping, and other elements.
  - Full shoulder widths should be run all the way to the first intersection. Shoulders can be reduced for the turn lanes, per the L&D.
  - Curbs should be avoided on the west approach to the quadrant roadway intersection.
  - Deceleration and taper lengths should be based on a 60 mph design speed.

- The horizontal curve under E. 55th should be based on a 60 mph design speed. It may be difficult to meet the 60 mph requirement for both curvature and superelevation. This location could be a candidate for a design exception given it's proximity to the lower-speed quadrant roadway intersection.

- **MOT Requirements for I-490**
  - HNTB inquired whether it would be acceptable to detour IR 490 traffic onto local streets during construction. Possible detour routes were discussed.
  - Issues related to MOT and constructability are usually at the discretion of the local ODOT District. District 12 would accept shutting down the IR 490 leg during construction, as there do not appear to be any other options.
  - A temporary runaround on E55th Street to the east could allow E55th Street to be maintained during construction of the bridge.
  - Another option discussed included construction of the boulevard east of E55th, then using the boulevard to detour E55th to Kinsman which reconnects back to E55th at Woodland. However, consideration should be given to the construction phasing, as this could require the railroad bridge to built first, before starting E. 55th, and could extend the construction timeline substantially.

- **Traffic Analysis Requirements**
  - Matt Wahl provided an overview of updates to the traffic model to include projected development traffic. Following completion of the modeling efforts HNTB updated the Synchro model. This was presented to the city of Cleveland's engineering and traffic departments. Their traffic group expressed a desire to maintain volume-to-capacity (v/c) ratios at or below 0.9, however they wanted to see the impacts associated with doing this.
  - As a rule of thumb, the intersections in the project area should be designed so that no v/c ratio of 0.9 to account for variance in traffic distribution. However, ODOT may consider higher v/c ratios depending on the costs and impacts.
  - ODOT Central Office staff will not require an IMS for this project since we are essentially maintaining the same number of lanes on I-490, just constructing them at a lower elevation.
  - HNTB should provide a memorandum with an operational analysis of the entire corridor, beginning at the IR 77 ramps to/from IR 490.
  - The operational analysis should include a Synchro run for the entire corridor with the timings optimized for progression along the boulevard.
  - The Synchro files should also be converted to Highway Capacity Software (HCS). For the HCS analyses, the timings should be adjusted to balance the approach delays. This could result in different levels of service and/or lane use requirements.
  - Costs, impacts, and operations will need to be weighed in determining the final lane use.

- The current preferred alternative corrects the inside merge condition from the IR 77 NB/SB ramps to IR 490 EB. HNTB should consider an add lane at this location that would become the EB right turn lane at the quadrant roadway intersection. HNTB should also check the capacity of the individual merges on the ramp as it transitions to a single lane.
- ODOT Central Office is going to contact FHWA to confirm that an IMS is not needed.

Opportunity Corridor

Geometrics/IMS Coordination Meeting

Monday, January 30, 2012

	Name	Representing	email address	Phone No.
1.	Larry Hoffman	ODOT Central Office	larry.hoffman@dot.state.oh.us	614-466-6439
2.	Tim Hill	ODOT Central Office	tim.hill@dot.state.oh.us	614-644-0377
3.	Dirk Gross	ODOT Central Office	dirk.gross@dot.state.oh.us	614-752-5576
4.	Matt Wahl	HNTB	mwahl@hntb.com	216-522-1140
5.	Jodi Heflin	HNTB	jheflin@hntb.com	216-633-2638
6.	Katie Zehnder	HNTB	kzehnder@hntb.com	614-228-1007
7.	Josh Epperson	HNTB	jepperson@hntb.com	614-228-1007
8.	Mark Carpenter	ODOT District 12	mark.carpenter@dot.state.oh.us	216-584-2089
9.	John Motl	ODOT District 12	john.motl@dot.state.oh.us	216-584-2085
10.	Dale Schiavoni	ODOT District 12	dale.schiavoni@dot.state.oh.us	216-584-2080
11.	Dave Short	ODOT District 12	dave.short@state.oh.us	216-584-2139
12.	Sarah Brown	HNTB	sebrown@hntb.com	216-377-5831
13.	Matt Regan	HNTB	mregan@hntb.com	216-377-5826

Meeting Notes

Date: January 26, 2012

Time: 1:00 p.m. – 2:30 p.m.

Location: City Hall, Room 501

Attendees: Andrew Cross, City of Cleveland Traffic
Thomas Boyer, City of Cleveland Engineering and Construction
Dale Schiavoni, ODOT District 12
John Motl, ODOT District 12
David Short, ODOT District 12
Matt Wahl, HNTB Corporation
Valerie Webb, HNTB Corporation

Re: **CUY-Opportunity Corridor PID 77333 – Lane Use**

Project Information

- The purpose of this meeting was to coordinate with the City of Cleveland regarding lane requirements and lane reconfigurations for intersecting local streets along the boulevard.
- HNTB has updated NOACA's travel demand model to develop turning movement volumes along the corridor using a 2020 design year. Synchro screen captures showing current proposed lane configurations and v/c ratios for AM and PM peak periods were provided, as well as traffic plates showing 2020 AM and PM peak hour volumes along the corridor. Limited copies of the preliminary HCS results were also on hand. Each intersection was discussed individually. Specific discussion points by intersection are listed below.

Lane Configuration Discussion

- Kinsman Road – Presented as a 4-lane road with 2 left turn lanes and a thru/right lane in the northwest direction and 1 left turn lane with a thru/right in the southeast direction. Synchro results showed v/c ratios over 1.0 EB in the HCS analysis. The City requested looking further in the HCS results to see what could be done to get all movements with v/c's under 0.90. The possibility of keeping 2 thru lanes in each direction and making Kinsman a standard 5-lane section was also discussed. From preliminary horizontal alignment investigations, this lane configuration would result in additional impacts. However, the City expressed a desire to have a 5-lane section on Kinsman if at all possible and asked that further investigation be done to see how the traffic on a 5-lane section operates and if there is a way to fit it in geometrically and avoid additional impacts.
- E. 79th Street – Preliminary HCS results showed v/c's over 0.90 in the EB direction. The City requested that HNTB determine how much the delay on the Boulevard and E. 79th would have to be unbalanced in order to have v/c's under 0.90 for all movements.
- Woodland Avenue – Presented as a 5-lane section on both the Boulevard and Woodland Avenue. The City requested analyzing adding an EB right turn lane on the Boulevard to help lower v/c's.
- E. 93rd Street – The City suggested adding a SB right turn lane at this intersection. Matt Wahl said we could comply but it would probably be best to keep it to a minimal length (~100') to avoid impacts to the new bridge over the railroad tracks to the north.

- Quincy Avenue – With the updated traffic volumes, Synchro analysis shows that, to avoid failing movements and high v/c ratios, the lane configuration needs to be changed from the previously proposed left and thru/right lane to a right and a thru/left lane. However, the geometry with this option is challenging due to three surrounding bridges on Quincy Avenue and E. 105th Street. The left and thru/right geometry has a much better change of fitting and avoiding impacts and interactions with the bridges. To make operations work with that geometry, two options were brought up by HNTB. The first is to close the east leg of this intersection completely, with full access to the area provided by the Woodhill roundabout. The City stated that they would like to avoid this option if at all possible. The second suggestion by HNTB was to restrict the SB left turns onto Quincy. This allows the intersection to operate acceptably with the preferred left and thru/right lane geometry. The City also did not favor this option but said that it was a better choice than completely closing the leg. They asked for additional HCS analysis to be done in this area to determine if there are other options.

- Cedar Avenue – With the Step 5 traffic volumes, a NB right turn lane was added at this intersection. However, the new Step 7 traffic shows that this lane is not necessary. The City expressed a desire to leave this lane there to allow for future growth in the area. The City also suggested that they suspect NB right turns will be more evenly distributed between Cedar and Carnegie than the model is showing.

- Carnegie Avenue – This intersection has the worst operating conditions in Synchro due to high volumes both NB and WB in the AM Peak Period. According to the analysis, the only option to lower v/c ratios is to add a thru lane onto E.105th Street. The City would like to have as many lanes as possible in this area to improve current and proposed operating conditions; they suggested looking into adding the NB right turn lane at Cedar as a thru/right lane and continuing that lane until Euclid Avenue to provide much capacity in this congested area. HNTB said they could look into how that would fit geometrically and if it would cause additional impacts.

- Euclid Avenue - The City suggested adding 5 seconds of all-red time to the E-W approach to more accurately portray the bus-only phase that occurs along Euclid Corridor.

- Chester Avenue – To achieve efficient operations, HNTB proposed reconfiguring the current 6-lane section on Chester. To do so, a thru lane would be eliminated in each direction and replaced by a right turn only and a left turn only lane in the EB direction and a left turn only lane WB. The City would prefer not to reconfigure this intersection and take away a thru lane but they were not opposed to it if that's what it takes to make the intersection operate efficiently, recognizing that adding an additional left turn lane on Chester would be difficult due to the existing geometry of Chester, substandard lane widths and presence of historic property.

Summary

Across the whole corridor, the City would like HNTB to look into what it would take to get all movements to have v/c ratio of less than 0.90. They realize that this will unbalance the approach delays and, in most cases, favor the boulevard over the side streets. Once the additional analysis is complete, they will review and give their final comments on the proposed lane configurations. HNTB said they would provide the updated HCS results to the City and ODOT within two weeks (i.e. on or before February 9th, 2012).

Appendix D: HCS Analysis Results - Signalized Intersections (2020 AM Peak Hour)

HCS+: Signalized Intersections Release 5.3

Analyst: TVF
Agency: HNTB
Date: 04/16/2012
Period: AM Peak Hour
Project ID: Recommended Preferred Alternative AM Peak Period (I-01)
E/W St: Quadrant

Inter.: E. 55th St & Quadrant
Area Type: All other areas
Jurisd:
Year : 2020
N/S St: E. 55th Street

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	2	0	1	2	0
LGConfig				L		R		TR		L	T	
Volume				260		200		1030	320	120	250	
Lane Width				11.0		11.0		11.0		11.0	11.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru					Thru	A		
Right					Right	A		
Peds					Peds	X		
WB Left		A			SB Left	A	A	
Thru					Thru	A	A	
Right		A			Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right	A		
Green		36.5				7.2	61.3	
Yellow		3.5				3.5	3.5	
All Red		1.5				1.5	1.5	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	520	1711	0.54	0.30	35.8	D		
							31.1	C
R	621	1531	0.35	0.41	25.0	C		
Northbound								
TR	1689	3307	0.87	0.51	31.0	C	31.0	C
Southbound								
L	163	1711	0.80	0.61	51.1	D		
T	2100	3428	0.13	0.61	9.8	A	23.2	C

Intersection Delay = 29.7 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.3

Analyst: TVF
Agency: HNTB
Date: 04/16/2012
Period: AM Peak Hour
Project ID: Recommended Preferred Alternative AM Peak Period (I-02)
E/W St: Boulevard

Inter.: Quadrant & Boulevard
Area Type: All other areas
Jurisd:
Year : 2020
N/S St: Quadrant

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	0	1	2	0	2	0	1	0	0	0
LGConfig		TR		L	T		L		R			
Volume		1800	260	200	1300		220		220			
Lane Width		11.0		11.0	11.0		11.0		11.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	A			
Thru	P				Thru				
Right	P				Right	A			
Peds	X				Peds				
WB Left	P	A			SB Left				
Thru	P	P			Thru				
Right					Right				
Peds					Peds				
NB Right		A			EB Right				
SB Right					WB Right				
Green	62.7	11.3				31.0			
Yellow	3.5	3.5				3.5			
All Red	1.5	1.5				1.5			

Cycle Length: 120.0 secs

Intersection Performance Summary

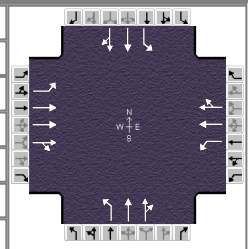
Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
TR	2514	4812	0.89	0.52	30.9	C	30.9	C
Westbound								
L	292	1711	0.74	0.66	52.8	D		
T	2257	3428	0.63	0.66	12.9	B	18.2	B
Northbound								
L	858	3322	0.28	0.26	35.7	D		
							31.0	C
R	603	1531	0.40	0.39	26.4	C		
Southbound								

Intersection Delay = 26.2 (sec/veh) Intersection LOS = C

HCS 2010 Signalized Intersection Results Summary

I-03 AM Peak Hour

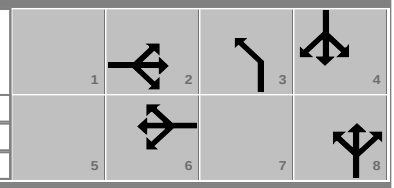
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	Apr 18, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Kinsman Rd	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	AM Peak - 3 EB thru lanes (I-03)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	1840	170	10	1230	10	250	300	10	10	120	20

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	58.4	11.5	36.6	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		63.4		63.4	15.0	56.6		41.6
Change Period, *(Y+Rc)*, s		5.0		5.0	3.5	5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0	2.8	3.1		3.1
Queue Clearance Time *(g_s)*, s					13.5	8.9		5.7
Green Extension Time *(g_e)*, s		0.0		0.0	0.0	0.9		0.9
Phase Call Probability					1.00	1.00		1.00
Max Out Probability					1.00	0.00		0.00

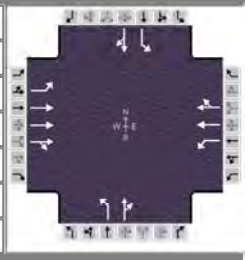
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	11	1473	712	11	675	673	272	169	168	11	77	76
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	403	1863	1780	179	1863	1857	1774	1863	1841	1039	1863	1771
Queue Service Time *(g_s)*, s	2.7	40.3	41.0	6.6	35.0	35.0	11.5	6.8	6.9	0.9	3.6	3.7
Cycle Queue Clearance Time *(g_c)*, s	37.7	40.3	41.0	47.7	35.0	35.0	11.5	6.8	6.9	0.9	3.6	3.7
Capacity *(c)*, veh/h	139	1813	866	86	907	904	567	801	792	377	568	540
Volume-to-Capacity Ratio *(X)*	0.078	0.813	0.822	0.127	0.744	0.745	0.479	0.211	0.212	0.029	0.135	0.140
Available Capacity *(c_a)*, veh/h	139	1813	866	86	907	904	567	801	792	377	568	540
Back of Queue *(Q)*, veh/ln (50th percentile)	0.3	17.6	17.6	0.4	16.1	16.1	5.3	3.0	2.9	0.2	1.6	1.6
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.45	0.45	0.02	0.56	0.56	0.33	0.19	0.19	0.02	0.12	0.12
Uniform Delay *(d_1)*, s/veh	40.0	26.2	26.3	46.7	24.8	24.8	24.6	21.4	21.5	29.3	30.2	30.3
Incremental Delay *(d_2)*, s/veh	0.5	1.9	4.1	2.7	4.9	5.0	0.2	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	40.5	28.0	30.4	49.4	29.7	29.8	24.9	21.5	21.5	29.3	30.3	30.3
Level of Service (LOS)	D	C	C	D	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	28.9	C		29.9	C		23.0	C		30.2	C	
Intersection Delay, s/veh / LOS	28.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	3.0	C
Bicycle LOS Score / LOS	1.7	A	1.6	A	1.0	A	0.6	A

HCS 2010 Signalized Intersection Results Summary

I-04 AM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	Apr 18, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. 75th Street	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	AM Peak (3 EB thru lanes) (I-04)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	1810	10	10	1230	10	10	40	20	10	10	20

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	64.5	45.5	0.0	0.0	0.0	0.0	
Yellow	3.5	3.5	0.0	0.0	0.0	0.0	
Red	1.5	1.5	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		69.5		69.5		50.5		50.5
Change Period, *(Y+Rc)*, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.2		3.2
Queue Clearance Time *(g_s)*, s						4.9		5.5
Green Extension Time *(g_e)*, s		0.0		0.0		0.2		0.2
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

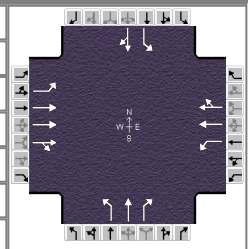
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	43	1320	658	11	675	673	11	65		11	33	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	403	1863	1857	219	1863	1857	1371	1757		1331	1663	
Queue Service Time *(g_s)*, s	10.5	30.5	30.5	4.5	31.5	31.5	0.6	2.9		0.6	1.5	
Cycle Queue Clearance Time *(g_c)*, s	42.1	30.5	30.5	35.0	31.5	31.5	2.1	2.9		3.5	1.5	
Capacity *(c)*, veh/h	171	2002	998	122	1001	998	563	666		533	631	
Volume-to-Capacity Ratio *(X)*	0.255	0.659	0.659	0.089	0.674	0.674	0.019	0.098		0.020	0.052	
Available Capacity *(c_a)*, veh/h	171	2002	998	122	1001	998	563	666		533	631	
Back of Queue *(Q)*, veh/ln (50th percentile)	1.2	13.1	13.5	0.3	14.0	14.0	0.2	1.2		0.2	0.6	
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Queue Storage Ratio *(RQ)* (50th percentile)	0.05	0.33	0.34	0.01	0.49	0.49	0.05	0.31		0.05	0.15	
Uniform Delay *(d_1)*, s/veh	35.4	19.9	19.9	32.4	20.1	20.1	24.3	24.0		25.1	23.6	
Incremental Delay *(d_2)*, s/veh	3.6	1.7	3.4	1.4	3.6	3.6	0.0	0.0		0.0	0.0	
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay *(d)*, s/veh	38.9	21.6	23.3	33.8	23.7	23.8	24.3	24.0		25.2	23.6	
Level of Service (LOS)	D	C	C	C	C	C	C	C		C	C	
Approach Delay, s/veh / LOS	22.5	C		23.8	C		24.1	C		24.0	C	
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.6	A	1.6	A	0.6	A	0.6	A

HCS 2010 Signalized Intersection Results Summary

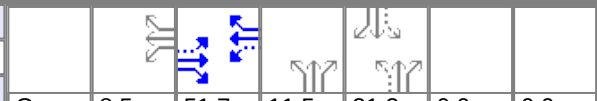
I-05 AM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	Apr 18, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. 79th Street	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	AM Peak - 3 EB thru lanes (I-05)				

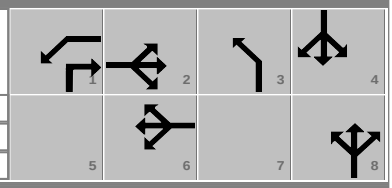


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	1670	140	90	1080	10	110	330	140	10	110	70

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.5	51.7	11.5	31.3	0.0	0.0
Yellow	3.5	3.5	3.5	3.5	0.0	0.0
Red	0.0	1.5	0.0	1.5	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8		4
Case Number		6.3	1.0	4.0	1.0	3.0		6.3
Phase Duration, s		56.7	12.0	68.7	15.0	51.3		36.3
Change Period, ($Y+R_c$), s		5.0	3.5	5.0	3.5	5.0		5.0
Max Allow Headway (*MAH*), s		0.0	2.8	0.0	2.8	3.2		3.2
Queue Clearance Time (g_s), s			5.4		7.4	19.6		13.2
Green Extension Time (g_e), s		0.0	0.0	0.0	0.1	1.4		1.4
Phase Call Probability			1.00		1.00	1.00		1.00
Max Out Probability			0.57		0.19	0.00		0.00

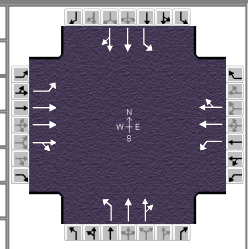
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	43	1328	640	98	593	591	120	359	152	11	196	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	471	1863	1786	1774	1863	1857	1774	1863	1579	1019	1741	
Queue Service Time (g_s), s	8.4	37.8	38.1	3.4	26.3	26.3	5.4	17.6	7.0	1.0	11.2	
Cycle Queue Clearance Time (g_c), s	22.7	37.8	38.1	3.4	26.3	26.3	5.4	17.6	7.0	3.6	11.2	
Capacity (*c*), veh/h	207	1605	770	211	989	986	428	719	721	304	454	
Volume-to-Capacity Ratio (*X*)	0.210	0.827	0.831	0.464	0.600	0.600	0.280	0.499	0.211	0.036	0.431	
Available Capacity (c_a), veh/h	207	1605	770	211	989	986	428	719	721	304	454	
Back of Queue (*Q*), veh/ln (50th percentile)	1.1	17.5	18.0	1.4	11.7	11.6	2.3	8.0	2.6	0.3	4.9	
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (50th percentile)	0.05	0.49	0.51	0.06	0.46	0.45	0.13	0.45	0.15	0.02	0.31	
Uniform Delay (d_1), s/veh	31.3	30.2	30.3	25.0	19.4	19.4	26.1	28.0	19.6	35.1	36.9	
Incremental Delay (d_2), s/veh	2.3	5.0	10.2	0.6	2.7	2.7	0.1	0.2	0.1	0.0	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	33.6	35.2	40.4	25.6	22.1	22.1	26.2	28.2	19.7	35.1	37.2	
Level of Service (LOS)	C	D	D	C	C	C	C	C	B	D	D	
Approach Delay, s/veh / LOS	36.9	D		22.3	C		25.8	C		37.1	D	
Intersection Delay, s/veh / LOS	30.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	3.2	C	3.0	C
Bicycle LOS Score / LOS	1.6	A	1.5	A	1.5	A	0.8	A

HCS 2010 Signalized Intersection Results Summary

I-06 AM Peak Hour

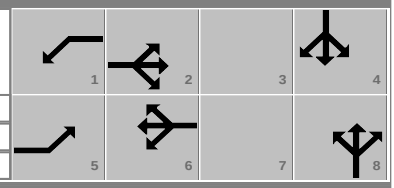
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Buckeye Rd	Analysis Year	2020	Analysis Period	1> 7:00
File Name	I-06_2012-04-24_RecPrefAlt_AMPeak_Blvd-Buckeye (3 EB thru).xus				
Project Description	AM Peak - 3 EB thru lanes (I-06)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	1720	80	40	960	10	210	640	270	10	420	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	50.0	48.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		6.0		6.0
Phase Duration, s	12.0	55.0	12.0	55.0		53.0		53.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (*MAH*), s	2.8	0.0	2.8	0.0		3.2		3.2
Queue Clearance Time (g_s), s	2.4		3.6			39.5		31.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		3.0		3.8
Phase Call Probability	1.00		1.00			1.00		1.00
Max Out Probability	0.01		0.28			0.42		0.12

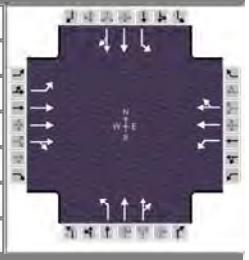
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	11	1314	643	43	528	526	228	521	468	11	234	233
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1774	1863	1818	1774	1863	1856	922	1863	1674	567	1863	1847
Queue Service Time (g_s), s	0.4	38.1	38.3	1.6	27.7	27.7	27.1	28.0	28.0	2.0	10.4	10.4
Cycle Queue Clearance Time (g_c), s	0.4	38.1	38.3	1.6	27.7	27.7	37.5	28.0	28.0	29.9	10.4	10.4
Capacity (*c*), veh/h	263	1552	758	185	776	773	349	745	670	155	745	739
Volume-to-Capacity Ratio (*X*)	0.041	0.846	0.849	0.235	0.680	0.680	0.654	0.699	0.699	0.070	0.315	0.315
Available Capacity (c_a), veh/h	263	1552	758	185	776	773	349	745	670	155	745	739
Back of Queue (*Q*), veh/ln (50th percentile)	0.2	17.2	17.4	0.6	12.9	12.9	6.3	12.7	11.5	0.3	4.5	4.5
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.01	0.47	0.48	0.03	0.49	0.49	0.40	0.81	0.73	0.02	0.26	0.25
Uniform Delay (d_1), s/veh	19.9	31.5	31.6	24.5	28.5	28.5	37.6	30.0	30.0	42.4	24.7	24.7
Incremental Delay (d_2), s/veh	0.0	2.8	5.7	0.2	4.2	4.2	3.5	2.5	2.7	0.1	0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	19.9	34.4	37.2	24.7	32.7	32.7	41.1	32.5	32.7	42.5	24.8	24.8
Level of Service (LOS)	B	C	D	C	C	C	D	C	C	D	C	C
Approach Delay, s/veh / LOS	35.2	D		32.4	C		34.2	C		25.2	C	
Intersection Delay, s/veh / LOS	33.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.6	A	1.4	A	1.5	A	0.9	A

HCS 2010 Signalized Intersection Results Summary

I-07 AM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Woodland Ave	Analysis Year	2020	Analysis Period	1> 7:00
File Name	I-07_2012-04-24_RecPrefAlt_AMPeak_Blvd-Woodland (3 EB thru) (balanced).xus				
Project Description	AM Peak - 3 EB thru lanes (I-07)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	1820	170	10	770	20	230	190	10	90	190	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	60.0	50.0	0.0	0.0	0.0	0.0	
Yellow	3.5	3.5	0.0	0.0	0.0	0.0	
Red	1.5	1.5	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		65.0		65.0		55.0		55.0
Change Period, $(Y+R_c)$, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						26.9		13.3
Green Extension Time (g_e), s		0.0		0.0		1.5		1.5
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

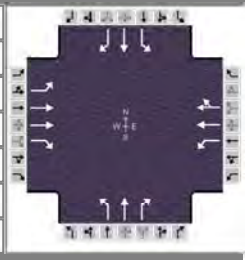
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	11	1459	704	11	431	427	250	109	108	98	109	108
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	641	1863	1779	183	1863	1846	1159	1863	1830	1159	1863	1830
Queue Service Time (g_s), s	1.3	38.6	39.3	6.3	18.1	18.1	20.5	4.4	4.4	6.9	4.4	4.4
Cycle Queue Clearance Time (g_c), s	19.4	38.6	39.3	45.6	18.1	18.1	24.9	4.4	4.4	11.3	4.4	4.4
Capacity *(c)*, veh/h	284	1863	889	92	931	923	500	776	762	500	776	762
Volume-to-Capacity Ratio *(X)*	0.038	0.783	0.792	0.119	0.463	0.463	0.500	0.141	0.142	0.195	0.141	0.142
Available Capacity (c_a), veh/h	284	1863	889	92	931	923	500	776	762	500	776	762
Back of Queue *(Q)*, veh/ln (50th percentile)	0.2	16.6	16.4	0.3	8.0	7.9	5.6	1.9	1.9	1.9	1.9	1.9
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.45	0.45	0.01	0.31	0.31	0.38	0.28	0.27	0.24	0.27	0.27
Uniform Delay (d_1), s/veh	25.8	24.7	24.8	43.7	19.5	19.5	29.4	21.7	21.7	25.2	21.7	21.7
Incremental Delay (d_2), s/veh	0.1	1.2	2.6	2.3	1.5	1.5	0.3	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	25.9	25.9	27.4	46.0	21.0	21.0	29.7	21.7	21.7	25.2	21.7	21.7
Level of Service (LOS)	C	C	C	D	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	26.4	C		21.3	C		26.0	C		22.8	C	
Intersection Delay, s/veh / LOS	24.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.7	A	1.2	A	0.9	A	0.7	A

HCS 2010 Signalized Intersection Results Summary

I-08 AM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 15, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. 93rd Street	Analysis Year	2020	Analysis Period	1> 7:00
File Name	I-08_2012-04-24_RecPrefAlt_AMPeak_Blvd-93rd-SB Right.xus				
Project Description	Recommended Preferred Alternative AM Peak (I-08)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	430	1480	10	40	580	10	20	410	200	10	230	220

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	27.5	39.5	39.5	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	0.0	1.5	1.5	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	3.0		6.3		5.0		5.0
Phase Duration, s	31.0	75.5		44.5		44.5		44.5
Change Period, *(Y+Rc)*, s	3.5	5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	0.0		0.0		3.1		3.1
Queue Clearance Time *(g_s)*, s	20.2					27.3		28.6
Green Extension Time *(g_e)*, s	0.5	0.0		0.0		2.2		2.1
Phase Call Probability	1.00					1.00		1.00
Max Out Probability	0.04					0.08		0.11

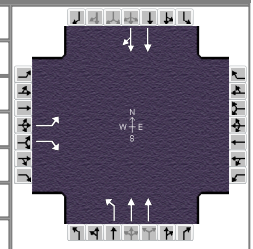
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	467	1609	11	43	322	320	22	446	217	11	250	239
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1773	1579	314	1863	1851	1125	1863	1579	940	1863	1579
Queue Service Time *(g_s)*, s	18.2	41.1	0.3	14.6	16.8	16.8	1.8	25.3	12.9	1.2	12.5	14.4
Cycle Queue Clearance Time *(g_c)*, s	18.2	41.1	0.3	24.7	16.8	16.8	14.3	25.3	12.9	26.6	12.5	14.4
Capacity *(c)*, veh/h	615	2084	927	137	613	609	313	613	520	171	613	520
Volume-to-Capacity Ratio *(X)*	0.760	0.772	0.012	0.318	0.524	0.525	0.069	0.727	0.418	0.064	0.408	0.460
Available Capacity *(c_a)*, veh/h	615	2084	927	137	613	609	313	613	520	171	613	520
Back of Queue *(Q)*, veh/ln (50th percentile)	7.4	16.0	0.1	1.3	8.0	8.0	0.5	12.2	5.0	0.3	5.7	5.6
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.31	0.56	0.00	0.12	0.41	0.40	0.03	0.82	0.34	0.01	0.21	1.42
Uniform Delay *(d_1)*, s/veh	18.3	18.7	10.3	39.7	32.6	32.6	36.7	35.5	31.3	47.2	31.2	31.8
Incremental Delay *(d_2)*, s/veh	2.2	1.3	0.0	5.8	3.1	3.1	0.0	3.8	0.2	0.1	0.2	0.2
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	20.5	20.0	10.3	45.5	35.7	35.8	36.8	39.3	31.5	47.3	31.3	32.1
Level of Service (LOS)	C	B	B	D	D	D	D	D	C	D	C	C
Approach Delay, s/veh / LOS	20.0	C		36.4	D		36.7	D		32.0	C	
Intersection Delay, s/veh / LOS	27.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.4	B	2.8	C	3.0	C
Bicycle LOS Score / LOS	2.2	B	1.1	A	1.6	A	1.3	A

HCS 2010 Signalized Intersection Results Summary

I-09 AM Peak Hour

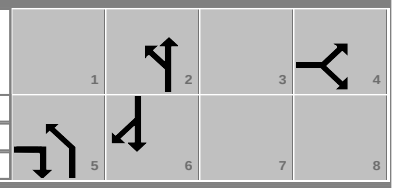
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Quincy Ave	Analysis Year	2020	Analysis Period	1> 7:00
File Name	I-09_2012-04-24_RecPrefAlt_AMPeak_Blvd-Quincy-Left and Thru-Right.xus				
Project Description	Recommended Preferred Alternative AM Peak (I-09)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10		10				130	1550			610	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.5	55.0	41.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	0.0	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		46.0			14.0	74.0		60.0
Change Period, ($Y+R_c$), s		5.0			3.5	5.0		5.0
Max Allow Headway (*MAH*), s		3.2			3.1	0.0		0.0
Queue Clearance Time (g_s), s		2.5			6.5			
Green Extension Time (g_e), s		0.0			0.1	0.0		0.0
Phase Call Probability		1.00			1.00			
Max Out Probability		0.00			0.38			

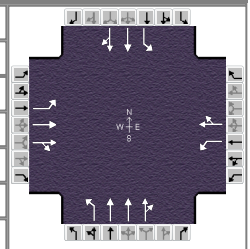
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	11		11				141	1685			338	336
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1774		1579				1774	1773			1863	1852
Queue Service Time (g_s), s	0.5		0.5				4.5	46.1			14.4	14.4
Cycle Queue Clearance Time (g_c), s	0.5		0.5				4.5	46.1			14.4	14.4
Capacity (*c*), veh/h	606		677				473	2039			854	849
Volume-to-Capacity Ratio (*X*)	0.018		0.016				0.299	0.826			0.396	0.396
Available Capacity (c_a), veh/h	606		677				473	2039			854	849
Back of Queue (*Q*), veh/ln (50th percentile)	0.2		0.2				1.8	18.6			6.5	6.5
Overflow Queue (Q_3), veh/ln	0.0		0.0				0.0	0.0			0.0	0.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.02		0.02				0.07	0.65			0.33	0.33
Uniform Delay (d_1), s/veh	26.2		19.7				13.9	20.6			21.5	21.5
Incremental Delay (d_2), s/veh	0.0		0.0				0.1	3.1			1.4	1.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	26.2		19.7				14.0	23.8			22.9	22.9
Level of Service (LOS)	C		B				B	C			C	C
Approach Delay, s/veh / LOS	22.9	C		0.0			23.0	C		22.9	C	
Intersection Delay, s/veh / LOS	23.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			2.0	A	1.0	A

HCS 2010 Signalized Intersection Results Summary

I-10 AM Peak Hour

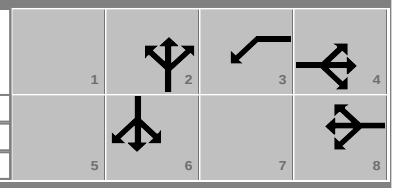
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Cedar Avenue	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	Recommended Preferred Alternative AM Peak (I 10)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	310	10	140	180	100	30	1050	420	30	460	70

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	54.7	8.5	43.3	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8		2		6
Case Number		6.3	1.0	4.0		6.0		6.0
Phase Duration, s		48.3	12.0	60.3		59.7		59.7
Change Period, $(Y+R_c)$, s		5.0	3.5	5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		3.1	2.8	3.1		0.0		0.0
Queue Clearance Time (g_s), s		10.0	8.2	15.6				
Green Extension Time (g_e), s		1.4	0.0	1.4		0.0		0.0
Phase Call Probability		1.00	1.00	1.00				
Max Out Probability		0.00	1.00	0.00				

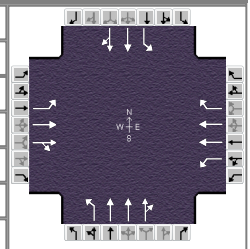
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	76	174	173	152	304		33	1141	457	33	294	282
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1071	1863	1842	1774	1750		834	1863	1579	317	1863	1777
Queue Service Time (g_s), s	6.0	7.9	8.0	6.2	13.6		3.2	28.8	26.6	10.8	12.2	12.3
Cycle Queue Clearance Time (g_c), s	7.6	7.9	8.0	6.2	13.6		15.5	28.8	26.6	39.6	12.2	12.3
Capacity *(c)*, veh/h	432	672	665	489	807		354	1698	720	128	849	810
Volume-to-Capacity Ratio *(X)*	0.176	0.260	0.261	0.311	0.377		0.092	0.672	0.634	0.254	0.346	0.349
Available Capacity (c_a), veh/h	432	672	665	489	807		354	1698	720	128	849	810
Back of Queue *(Q)*, veh/ln (50th percentile)	1.5	3.5	3.5	2.6	5.5		0.7	12.7	10.2	1.0	5.5	5.3
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.16	0.36	0.36	0.17	0.37		0.03	0.54	0.43	0.05	0.27	0.26
Uniform Delay (d_1), s/veh	27.5	27.0	27.1	20.5	21.1		26.1	25.6	25.0	41.2	21.1	21.1
Incremental Delay (d_2), s/veh	0.1	0.1	0.1	0.1	0.1		0.3	1.4	2.7	4.4	1.1	1.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	27.6	27.1	27.1	20.6	21.2		26.5	27.0	27.7	45.6	22.1	22.2
Level of Service (LOS)	C	C	C	C	C		C	C	C	D	C	C
Approach Delay, s/veh / LOS	27.2	C		21.0	C		27.2	C		23.4	C	
Intersection Delay, s/veh / LOS	25.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	3.2	C	2.7	B	2.4	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	1.4	A	1.0	A

HCS 2010 Signalized Intersection Results Summary

I-11 AM Peak Hour

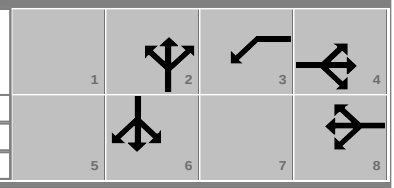
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Carnegie Avenue	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	Recommended Preferred Alternative AM Peak (I 11)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	530	30	180	1530	110	50	1050	20	40	380	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	47.0	10.5	49.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8		2		6
Case Number		6.3	1.0	3.0		6.0		6.0
Phase Duration, s		54.0	14.0	68.0		52.0		52.0
Change Period, *(Y+Rc)*, s		5.0	3.5	5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		3.1	2.8	3.1		0.0		0.0
Queue Clearance Time *(g_s)*, s		42.4	9.3	52.3				
Green Extension Time *(g_e)*, s		3.9	0.0	5.4		0.0		0.0
Phase Call Probability		1.00	1.00	1.00				
Max Out Probability		0.69	1.00	0.45				

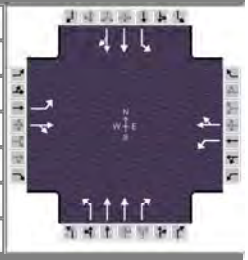
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	11	307	302	196	1663	120	54	778	385	43	213	211
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	298	1863	1827	1774	1773	1579	959	1863	1844	481	1863	1846
Queue Service Time *(g_s)*, s	4.1	14.0	14.0	7.3	50.3	4.7	5.0	19.3	19.3	9.2	9.4	9.4
Cycle Queue Clearance Time *(g_c)*, s	40.4	14.0	14.0	7.3	50.3	4.7	14.4	19.3	19.3	28.4	9.4	9.4
Capacity *(c)*, veh/h	91	761	746	451	1862	829	360	1459	722	171	730	723
Volume-to-Capacity Ratio *(X)*	0.119	0.403	0.405	0.434	0.893	0.144	0.151	0.533	0.533	0.254	0.291	0.292
Available Capacity *(c_a)*, veh/h	91	761	746	451	1862	829	360	1459	722	171	730	723
Back of Queue *(Q)*, veh/ln (50th percentile)	0.3	6.1	6.0	2.9	21.4	1.7	1.2	8.6	8.7	1.2	4.3	4.3
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.19	0.19	0.12	0.64	0.05	0.05	0.35	0.35	0.06	0.22	0.22
Uniform Delay *(d_1)*, s/veh	49.8	25.1	25.2	17.4	25.5	14.6	30.0	28.1	28.1	39.0	25.1	25.1
Incremental Delay *(d_2)*, s/veh	0.2	0.1	0.1	0.2	5.8	0.0	0.5	0.8	1.5	3.3	0.9	0.9
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	50.0	25.3	25.3	17.7	31.3	14.7	30.5	28.8	29.6	42.3	26.0	26.0
Level of Service (LOS)	D	C	C	B	C	B	C	C	C	D	C	C
Approach Delay, s/veh / LOS	25.7	C		28.9	C		29.1	C		27.5	C	
Intersection Delay, s/veh / LOS	28.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	3.1	C	2.9	C	2.8	C
Bicycle LOS Score / LOS	1.0	A	2.1	B	1.2	A	0.9	A

HCS 2010 Signalized Intersection Results Summary

I-12 AM Peak Hour

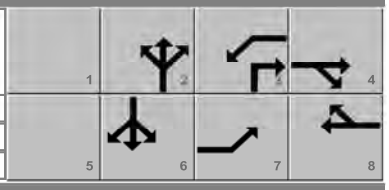
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Euclid Avenue	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	Recommended Preferred Alternative AM Peak (I 12)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	160	300	60	40	410	20	90	520	480	10	310	260

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	36.8	22.5	40.7	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	6.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8		2		6
Case Number	2.0	4.0	2.0	4.0		5.0		6.0
Phase Duration, s	27.5	50.7	27.5	50.7		41.8		41.8
Change Period, *(Y+Rc)*, s	5.0	10.0	5.0	10.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	3.2	2.8	3.2		0.0		0.0
Queue Clearance Time *(g_s)*, s	12.6	23.9	4.4	28.9				
Green Extension Time *(g_e)*, s	0.2	1.8	0.0	1.6		0.0		0.0
Phase Call Probability	1.00	1.00	1.00	1.00				
Max Out Probability	0.00	0.01	0.00	0.04				

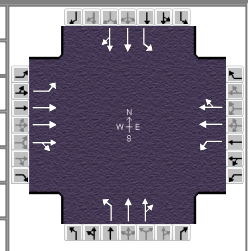
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	174	391		43	467		98	565	522	11	337	283
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1808		1774	1847		801	1773	1579	842	1863	1579
Queue Service Time *(g_s)*, s	10.6	21.9		2.4	26.9		14.1	15.8	30.0	1.3	18.4	18.1
Cycle Queue Clearance Time *(g_c)*, s	10.6	21.9		2.4	26.9		32.5	15.8	30.0	17.1	18.4	18.1
Capacity *(c)*, veh/h	333	613		333	627		183	1088	780	208	571	484
Volume-to-Capacity Ratio *(X)*	0.523	0.638		0.131	0.746		0.535	0.520	0.669	0.052	0.590	0.584
Available Capacity *(c_a)*, veh/h	333	613		333	627		183	1088	780	208	571	484
Back of Queue *(Q)*, veh/ln (50th percentile)	4.8	10.0		1.1	12.9		3.0	6.8	11.1	0.3	8.9	7.5
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.24	0.51		0.05	0.62		0.13	0.29	0.28	0.02	0.50	0.42
Uniform Delay *(d_1)*, s/veh	43.9	33.4		40.6	35.1		49.0	34.3	22.9	41.3	35.2	35.1
Incremental Delay *(d_2)*, s/veh	0.7	1.7		0.1	4.3		4.1	0.7	1.7	0.4	4.0	4.6
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	44.6	35.1		40.7	39.4		53.1	35.0	24.6	41.8	39.2	39.7
Level of Service (LOS)	D	D		D	D		D	C	C	D	D	D
Approach Delay, s/veh / LOS	38.1	D		39.5	D		31.9	C		39.5	D	
Intersection Delay, s/veh / LOS	36.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.4	A	1.3	A	1.5	A	1.0	A

HCS 2010 Signalized Intersection Results Summary

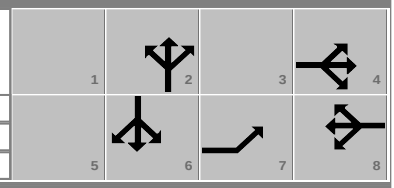
I-13 AM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	Chester Avenue	Analysis Year	2020	Analysis Period	1> 7:00
File Name					
Project Description	Recommended Preferred Alternative AM Peak (I 13)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	170	510	90	10	1120	90	90	530	30	40	460	10

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
				Green	42.7	9.5	54.3	0.0	0.0	0.0		
				Yellow	3.5	3.5	3.5	0.0	0.0	0.0		
				Red	1.5	0.0	1.5	0.0	0.0	0.0		



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2		6
Case Number	1.0	4.0		6.3		6.0		6.0
Phase Duration, s	13.0	72.3		59.3		47.7		47.7
Change Period, *(Y+Rc)*, s	3.5	5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	3.1		3.1		0.0		0.0
Queue Clearance Time *(g_s)*, s	8.3	9.3		38.7				
Green Extension Time *(g_e)*, s	0.0	5.0		4.4		0.0		0.0
Phase Call Probability	1.00	1.00		1.00				
Max Out Probability	1.00	0.00		0.16				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	185	443	209	11	665	650	98	307	302	43	256	255
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1863	1718	777	1863	1814	886	1863	1827	809	1863	1849
Queue Service Time *(g_s)*, s	6.3	7.1	7.3	0.9	36.5	36.7	11.1	15.2	15.3	5.3	12.3	12.4
Cycle Queue Clearance Time *(g_c)*, s	6.3	7.1	7.3	0.9	36.5	36.7	23.5	15.2	15.3	20.6	12.3	12.4
Capacity *(c)*, veh/h	261	2089	964	412	843	821	284	663	650	245	663	658
Volume-to-Capacity Ratio *(X)*	0.707	0.212	0.217	0.026	0.789	0.792	0.345	0.463	0.464	0.178	0.387	0.387
Available Capacity *(c_a)*, veh/h	261	2089	964	412	843	821	284	663	650	245	663	658
Back of Queue *(Q)*, veh/ln (50th percentile)	6.0	2.9	2.8	0.2	16.8	16.5	2.6	7.0	6.9	1.1	5.8	5.7
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.25	0.12	0.12	0.01	0.59	0.58	0.13	0.36	0.35	0.07	0.37	0.36
Uniform Delay *(d_1)*, s/veh	24.0	13.1	13.2	18.2	28.0	28.0	37.6	29.8	29.8	37.8	28.9	28.9
Incremental Delay *(d_2)*, s/veh	7.2	0.0	0.0	0.0	4.7	4.9	2.0	1.4	1.5	1.6	1.7	1.7
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	31.2	13.2	13.2	18.3	32.6	32.9	39.7	31.2	31.3	39.3	30.6	30.6
Level of Service (LOS)	C	B	B	B	C	C	D	C	C	D	C	C
Approach Delay, s/veh / LOS	17.2	B		32.7	C		32.4	C		31.3	C	
Intersection Delay, s/veh / LOS	28.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	3.0	C
Bicycle LOS Score / LOS	0.9	A	1.6	A	1.1	A	0.9	A

Appendix E: HCS Analysis Results - Signalized Intersections (2020 PM Peak Hour)

HCS+: Signalized Intersections Release 5.3

Analyst: TVF
Agency: HNTB
Date: 04/18/2012
Period: PM
Project ID: Recommended Preferred Alternative PM Peak Period (I-01)
E/W St: Quadrant

Inter.: E. 55th St & Quadrant
Area Type: All other areas
Jurisd:
Year : 2020
N/S St: E. 55th Street

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	2	0	1	2	0
LGConfig				L		R		TR		L	T	
Volume				120		120		240	170	240	1290	
Lane Width				11.0		11.0		11.0		11.0	11.0	
RTOR Vol						0			0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru					Thru	P		
Right					Right	A		
Peds					Peds	X		
WB Left	A				SB Left	A	P	
Thru					Thru	P	P	
Right	A				Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right	A		
Green	35.0					7.0	43.0	
Yellow	3.5					3.5	3.5	
All Red	1.5					1.5	1.5	

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
Westbound								
L	599	1711	0.22	0.35	23.0	C		
							19.3	B
R	720	1531	0.18	0.47	15.5	B		
Northbound								
TR	1382	3215	0.32	0.43	19.5	B	19.5	B
Southbound								
L	471	1711	0.55	0.55	18.0	B		
T	1885	3428	0.74	0.55	19.8	B	19.5	B

Intersection Delay = 19.5 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.3

Analyst: TVF
Agency: HNTB
Date: 04/18/2012
Period: PM
Project ID: Recommended Preferred Alternative (I-02)
E/W St: Boulevard

Inter.: Boulevard & Quadrant
Area Type: All other areas
Jurisd:
Year : 2020
N/S St: Quadrant

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	0	1	2	0	2	0	1	0	0	0
LGConfig		TR		L	T		L		R			
Volume		1250	160	80	1220		230		180			
Lane Width		11.0		11.0	11.0		11.0		11.0			
RTOR Vol			0						0			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	A		
Thru	P				Thru			
Right	P				Right	A		
Peds	X				Peds			
WB Left	P	A			SB Left			
Thru	P	P			Thru			
Right					Right			
Peds					Peds			
NB Right		A			EB Right			
SB Right					WB Right			
Green	46.0	10.0				29.0		
Yellow	3.5	3.5				3.5		
All Red	1.5	1.5				1.5		

Cycle Length: 100.0 secs

Intersection Performance Summary

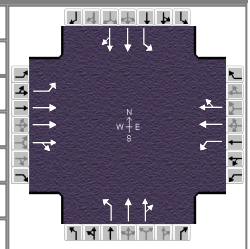
Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
TR	2218	4821	0.69	0.46	23.2	C	23.2	C
Westbound								
L	331	1711	0.26	0.61	25.2	C		
T	2091	3428	0.63	0.61	13.5	B	14.3	B
Northbound								
L	963	3322	0.26	0.29	27.4	C		
							23.4	C
R	674	1531	0.29	0.44	18.2	B		
Southbound								

Intersection Delay = 19.5 (sec/veh) Intersection LOS = B

HCS 2010 Signalized Intersection Results Summary

I-03 PM Peak Hour

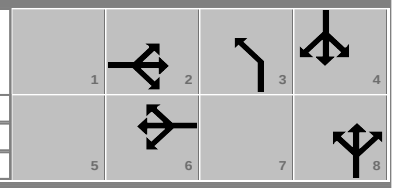
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Kinsman Road	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I-03)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	1160	250	10	1160	10	130	230	10	10	250	10

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	46.0	11.5	29.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		51.0		51.0	15.0	49.0		34.0
Change Period, *(Y+Rc)*, s		5.0		5.0	3.5	5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0	2.8	3.0		3.0
Queue Clearance Time *(g_s)*, s					7.0	6.3		7.9
Green Extension Time *(g_e)*, s		0.0		0.0	0.1	1.0		0.9
Phase Call Probability					1.00	1.00		1.00
Max Out Probability					0.09	0.00		0.00

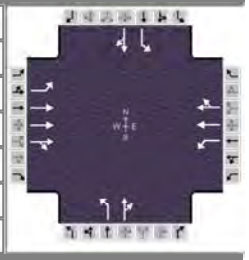
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	11	1054	478	11	637	635	141	131	130	11	142	141
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	434	1863	1690	338	1863	1857	1774	1863	1835	1114	1863	1837
Queue Service Time *(g_s)*, s	2.1	21.3	21.3	2.5	28.0	28.1	5.0	4.2	4.3	0.7	5.8	5.9
Cycle Queue Clearance Time *(g_c)*, s	30.2	21.3	21.3	23.8	28.0	28.1	5.0	4.2	4.3	0.7	5.8	5.9
Capacity *(c)*, veh/h	150	1714	777	155	857	854	528	820	807	395	540	533
Volume-to-Capacity Ratio *(X)*	0.073	0.615	0.615	0.070	0.743	0.743	0.267	0.160	0.161	0.028	0.262	0.264
Available Capacity *(c_a)*, veh/h	150	1714	777	155	857	854	528	820	807	395	540	533
Back of Queue *(Q)*, veh/ln (50th percentile)	0.3	9.0	8.5	0.2	12.7	12.7	2.0	1.8	1.7	0.2	2.6	2.5
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.23	0.22	0.01	0.45	0.45	0.13	0.11	0.11	0.01	0.19	0.18
Uniform Delay *(d_1)*, s/veh	34.5	20.3	20.3	29.3	22.2	22.2	18.3	16.9	16.9	25.5	27.3	27.3
Incremental Delay *(d_2)*, s/veh	0.8	1.3	2.9	0.8	5.2	5.3	0.1	0.0	0.0	0.0	0.1	0.1
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	35.3	21.7	23.3	30.1	27.4	27.4	18.4	16.9	16.9	25.5	27.4	27.4
Level of Service (LOS)	D	C	C	C	C	C	B	B	B	C	C	C
Approach Delay, s/veh / LOS	22.3	C		27.4	C		17.4	B		27.3	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	3.0	C
Bicycle LOS Score / LOS	1.3	A	1.5	A	0.8	A	0.7	A

HCS 2010 Signalized Intersection Results Summary

I-04 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. 75th Street	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I-04)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	1130	10	20	1150	10	10	20	20	10	40	10

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	52.5	37.5	0.0	0.0	0.0	0.0	
Yellow	3.5	3.5	0.0	0.0	0.0	0.0	
Red	1.5	1.5	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		57.5		57.5		42.5		42.5
Change Period, *(Y+Rc)*, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.2		3.2
Queue Clearance Time *(g_s)*, s						4.5		4.1
Green Extension Time *(g_e)*, s		0.0		0.0		0.2		0.2
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

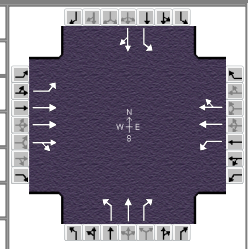
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	43	827	412	22	631	630	11	43		11	54	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	438	1863	1854	447	1863	1857	1344	1709		1357	1798	
Queue Service Time *(g_s)*, s	7.9	13.6	13.6	3.1	24.4	24.4	0.5	1.6		0.5	1.9	
Cycle Queue Clearance Time *(g_c)*, s	32.3	13.6	13.6	16.7	24.4	24.4	2.5	1.6		2.1	1.9	
Capacity *(c)*, veh/h	195	1956	973	246	978	975	550	641		559	674	
Volume-to-Capacity Ratio *(X)*	0.223	0.423	0.423	0.088	0.646	0.646	0.020	0.068		0.019	0.081	
Available Capacity *(c_a)*, veh/h	195	1956	973	246	978	975	550	641		559	674	
Back of Queue *(Q)*, veh/ln (50th percentile)	0.9	5.5	5.6	0.4	10.5	10.5	0.2	0.7		0.2	0.8	
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Queue Storage Ratio *(RQ)* (50th percentile)	0.04	0.14	0.14	0.02	0.37	0.37	0.04	0.17		0.04	0.21	
Uniform Delay *(d_1)*, s/veh	28.7	14.5	14.5	19.6	17.1	17.1	20.9	20.0		20.7	20.1	
Incremental Delay *(d_2)*, s/veh	2.0	0.5	1.1	0.7	3.3	3.3	0.0	0.0		0.0	0.0	
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay *(d)*, s/veh	30.7	15.0	15.6	20.3	20.3	20.4	20.9	20.1		20.7	20.2	
Level of Service (LOS)	C	B	B	C	C	C	C	C		C	C	
Approach Delay, s/veh / LOS	15.7	B		20.4	C		20.2	C		20.3	C	
Intersection Delay, s/veh / LOS	18.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.3	B	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.2	A	1.5	A	0.6	A	0.6	A

HCS 2010 Signalized Intersection Results Summary

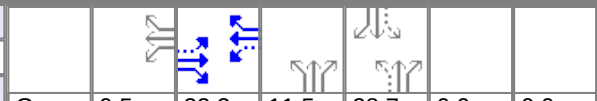
I-05 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. 79th Street	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I-05)				

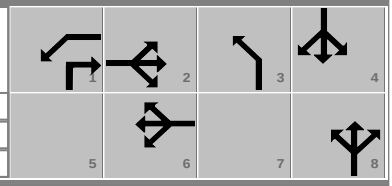


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	950	180	210	1010	10	120	170	170	10	260	50

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	9.5	33.3	11.5	28.7	0.0	0.0
Yellow	3.5	3.5	3.5	3.5	0.0	0.0
Red	0.0	1.5	0.0	1.5	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8		4
Case Number		6.3	1.0	4.0	1.0	3.0		6.3
Phase Duration, s		38.3	13.0	51.3	15.0	48.7		33.7
Change Period, $(Y+R_c)$, s		5.0	3.5	5.0	3.5	5.0		5.0
Max Allow Headway *(MAH)*, s		0.0	2.8	0.0	2.8	3.2		3.2
Queue Clearance Time (g_s), s			10.2		6.6	8.2		18.3
Green Extension Time (g_e), s		0.0	0.0	0.0	0.1	1.4		1.2
Phase Call Probability			1.00		1.00	1.00		1.00
Max Out Probability			1.00		0.06	0.00		0.04

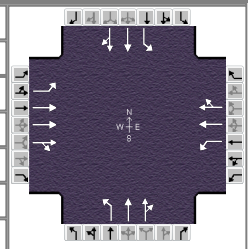
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	43	842	387	228	555	553	130	185	185	11	337	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	506	1863	1707	1774	1863	1856	1774	1863	1579	1194	1810	
Queue Service Time (g_s), s	7.2	19.5	19.5	8.2	22.8	22.8	4.6	6.2	6.2	0.7	16.3	
Cycle Queue Clearance Time (g_c), s	17.0	19.5	19.5	8.2	22.8	22.8	4.6	6.2	6.2	0.7	16.3	
Capacity (*c*), veh/h	191	1241	569	303	862	859	405	814	840	415	520	
Volume-to-Capacity Ratio (*X*)	0.228	0.678	0.680	0.754	0.644	0.644	0.322	0.227	0.220	0.026	0.649	
Available Capacity (c_a), veh/h	191	1241	569	303	862	859	405	814	840	415	520	
Back of Queue (*Q*), veh/ln (50th percentile)	1.0	8.9	8.7	4.5	10.2	10.2	1.9	2.7	2.2	0.2	7.4	
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (50th percentile)	0.04	0.25	0.25	0.19	0.40	0.40	0.11	0.15	0.12	0.01	0.47	
Uniform Delay (d_1), s/veh	32.0	28.7	28.8	21.8	20.5	20.5	19.9	17.6	12.4	25.7	31.2	
Incremental Delay (d_2), s/veh	2.8	3.0	6.4	9.2	3.7	3.7	0.2	0.1	0.0	0.0	2.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	34.8	31.7	35.2	31.0	24.2	24.2	20.1	17.6	12.5	25.7	33.5	
Level of Service (LOS)	C	C	D	C	C	C	C	B	B	C	C	
Approach Delay, s/veh / LOS	32.9	C		25.4	C		16.4	B		33.2	C	
Intersection Delay, s/veh / LOS	27.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	3.2	C	3.0	C
Bicycle LOS Score / LOS	1.2	A	1.6	A	1.3	A	1.1	A

HCS 2010 Signalized Intersection Results Summary

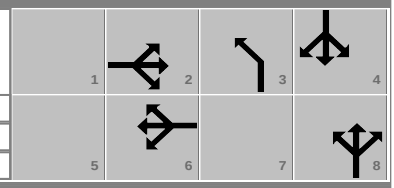
I-06 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 4, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Buckeye Road	Analysis Year	2020	Analysis Period	1> 17:00
File Name	2012-05-04_I-06_RecPrefAlt_PMPeak_Buckeye.xus				
Project Description	Recommended Preferred Alternative PM Peak (I-06)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	980	130	140	1140	10	70	550	220	10	650	10

Signal Information					EB			WB			NB			SB		
Cycle, s	100.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	46.0	8.5		32.0	0.0	0.0	0.0					
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.5	3.5		3.5	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0		1.5	0.0	0.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		51.0		51.0	12.0	49.0		37.0
Change Period, *(Y+Rc)*, s		5.0		5.0	3.5	5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0	2.8	3.1		3.1
Queue Clearance Time *(g_s)*, s					4.6	19.3		18.3
Green Extension Time *(g_e)*, s		0.0		0.0	0.0	3.3		3.0
Phase Call Probability					1.00	1.00		1.00
Max Out Probability					0.14	0.01		0.11

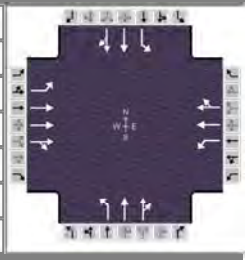
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	11	821	386	152	626	624	76	440	397	11	360	358
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	443	1863	1748	461	1863	1857	1774	1863	1681	654	1863	1853
Queue Service Time *(g_s)*, s	2.0	15.3	15.3	30.7	27.3	27.3	2.6	17.3	17.3	1.2	16.3	16.3
Cycle Queue Clearance Time *(g_c)*, s	29.4	15.3	15.3	46.0	27.3	27.3	2.6	17.3	17.3	6.6	16.3	16.3
Capacity *(c)*, veh/h	155	1714	804	214	857	854	338	820	740	246	596	593
Volume-to-Capacity Ratio *(X)*	0.070	0.479	0.480	0.712	0.730	0.731	0.225	0.536	0.537	0.044	0.603	0.604
Available Capacity *(c_a)*, veh/h	155	1714	804	214	857	854	338	820	740	246	596	593
Back of Queue *(Q)*, veh/ln (50th percentile)	0.2	6.4	6.3	4.6	12.3	12.2	1.0	7.2	6.6	0.2	7.2	7.2
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.18	0.17	0.19	0.46	0.46	0.07	0.46	0.42	0.01	0.41	0.41
Uniform Delay *(d_1)*, s/veh	33.9	18.7	18.7	35.7	22.0	22.0	19.1	20.5	20.5	27.3	28.7	28.7
Incremental Delay *(d_2)*, s/veh	0.7	0.8	1.7	15.3	4.5	4.5	0.1	0.4	0.4	0.0	1.2	1.2
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	34.6	19.5	20.4	51.0	26.5	26.5	19.3	20.9	21.0	27.4	29.9	29.9
Level of Service (LOS)	C	B	C	D	C	C	B	C	C	C	C	C
Approach Delay, s/veh / LOS	19.9	B		29.1	C		20.8	C		29.9	C	
Intersection Delay, s/veh / LOS	24.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.2	A	1.6	A	1.2	A	1.1	A

HCS 2010 Signalized Intersection Results Summary

I-07 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Woodland Ave	Analysis Year	2020	Analysis Period	1> 17:00
File Name	2012-05-04_I-07_RecPrefAlt_PMPeak-Woodland.xus				
Project Description	Recommended Preferred Alternative PM Peak (I-07)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	960	240	10	1170	80	110	180	10	50	200	10

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	51.0	39.0	0.0	0.0	0.0	0.0	
Yellow	3.5	3.5	0.0	0.0	0.0	0.0	
Red	1.5	1.5	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		56.0		56.0		44.0		44.0
Change Period, $(Y+R_c)$, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						13.6		8.8
Green Extension Time (g_e), s		0.0		0.0		1.1		1.1
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

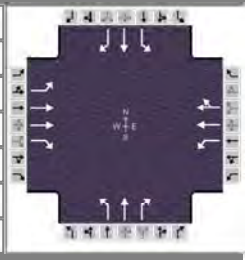
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	11	901	404	11	686	673	120	104	103	54	115	114
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	399	1863	1669	420	1863	1820	1148	1863	1828	1171	1863	1831
Queue Service Time (g_s), s	2.2	15.6	15.6	1.7	28.6	28.7	7.6	3.6	3.6	3.1	4.0	4.0
Cycle Queue Clearance Time (g_c), s	30.9	15.6	15.6	17.4	28.6	28.7	11.6	3.6	3.6	6.8	4.0	4.0
Capacity *(c)*, veh/h	161	1900	851	221	950	928	473	726	713	486	726	714
Volume-to-Capacity Ratio *(X)*	0.068	0.474	0.475	0.049	0.722	0.725	0.253	0.143	0.144	0.112	0.158	0.159
Available Capacity (c_a), veh/h	161	1900	851	221	950	928	473	726	713	486	726	714
Back of Queue *(Q)*, veh/ln (50th percentile)	0.2	6.4	5.9	0.2	11.9	11.7	2.0	1.5	1.5	0.9	1.7	1.7
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.01	0.18	0.16	0.01	0.47	0.46	0.14	0.22	0.22	0.11	0.25	0.24
Uniform Delay (d_1), s/veh	31.1	15.8	15.8	21.4	19.0	19.0	23.6	19.7	19.7	21.9	19.8	19.8
Incremental Delay (d_2), s/veh	0.7	0.7	1.5	0.2	2.1	2.2	0.1	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	31.7	16.5	17.4	21.6	21.1	21.2	23.7	19.7	19.7	21.9	19.9	19.9
Level of Service (LOS)	C	B	B	C	C	C	C	B	B	C	B	B
Approach Delay, s/veh / LOS	16.9	B		21.1	C		21.2	C		20.3	C	
Intersection Delay, s/veh / LOS	19.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.2	A	1.6	A	0.8	A	0.7	A

HCS 2010 Signalized Intersection Results Summary

I-08 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 15, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. 93rd Street	Analysis Year	2020	Analysis Period	1> 17:00
File Name	2012-05-04_I-08_RecPrefAlt_PMPeak_-93rd_with SB Right.xus				
Project Description	Recommended Preferred Alternative PM Peak (I-08)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	230	780	10	130	930	10	20	360	180	10	430	320

Signal Information												
Cycle, s	100.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	10.5	40.0	36.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	3.5	0.0	0.0	0.0		
				Red	0.0	1.5	1.5	0.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	3.0		6.3		5.0		5.0
Phase Duration, s	14.0	59.0		45.0		41.0		41.0
Change Period, *(Y+Rc)*, s	3.5	5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	0.0		0.0		3.1		3.1
Queue Clearance Time *(g_s)*, s	9.8					25.5		23.4
Green Extension Time *(g_e)*, s	0.0	0.0		0.0		2.5		2.7
Phase Call Probability	1.00					1.00		1.00
Max Out Probability	1.00					0.18		0.11

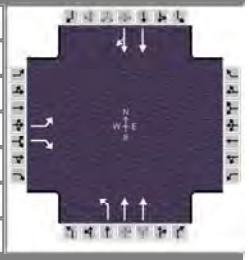
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	250	848	11	141	512	510	22	391	196	11	467	348
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1773	1579	647	1863	1856	922	1863	1579	989	1863	1579
Queue Service Time *(g_s)*, s	7.8	14.5	0.3	16.9	22.7	22.7	2.1	17.0	9.1	0.9	21.4	18.1
Cycle Queue Clearance Time *(g_c)*, s	7.8	14.5	0.3	17.3	22.7	22.7	23.5	17.0	9.1	17.9	21.4	18.1
Capacity *(c)*, veh/h	353	1915	852	328	745	742	206	671	568	260	671	568
Volume-to-Capacity Ratio *(X)*	0.708	0.443	0.013	0.431	0.687	0.687	0.105	0.584	0.344	0.042	0.697	0.612
Available Capacity *(c_a)*, veh/h	353	1915	852	328	745	742	206	671	568	260	671	568
Back of Queue *(Q)*, veh/ln (50th percentile)	3.4	5.6	0.1	2.8	10.5	10.5	0.5	7.5	3.3	0.2	9.8	6.9
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.14	0.19	0.00	0.26	0.53	0.53	0.03	0.51	0.23	0.01	0.37	1.74
Uniform Delay *(d_1)*, s/veh	18.7	13.9	10.7	23.4	24.8	24.8	37.4	25.9	23.4	33.2	27.3	26.3
Incremental Delay *(d_2)*, s/veh	4.7	0.6	0.0	3.8	4.7	4.7	0.1	0.9	0.1	0.0	2.7	1.4
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	23.4	14.5	10.7	27.1	29.5	29.6	37.5	26.8	23.5	33.2	30.0	27.7
Level of Service (LOS)	C	B	B	C	C	C	D	C	C	C	C	C
Approach Delay, s/veh / LOS	16.5	B		29.3	C		26.1	C		29.1	C	
Intersection Delay, s/veh / LOS	24.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.4	B	2.8	C	2.9	C
Bicycle LOS Score / LOS	1.4	A	1.4	A	1.5	A	1.9	A

HCS 2010 Signalized Intersection Results Summary

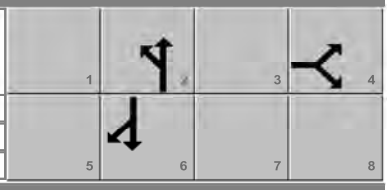
I-09 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Quincy Ave	Analysis Year	2020	Analysis Period	1> 17:00
File Name	2012-05-04_I-09_PMPeak-Quincy-Left and Thru-Right.xus				
Project Description	Recommended Preferred Alternative PM Peak (I-09)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10		10				90	870			1050	20

Signal Information					EB		WB			
Cycle, s	100.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	52.0	38.0	0.0	0.0	0.0	0.0
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2		6
Case Number		9.0				6.0		8.0
Phase Duration, s		43.0				57.0		57.0
Change Period, *(Y+Rc)*, s		5.0				5.0		5.0
Max Allow Headway *(MAH)*, s		3.2				0.0		0.0
Queue Clearance Time *(g_s)*, s		2.4						
Green Extension Time *(g_e)*, s		0.0				0.0		0.0
Phase Call Probability		1.00						
Max Out Probability		0.00						

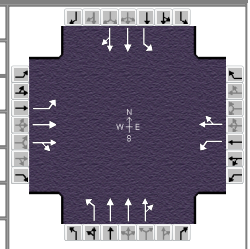
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate *(v)*, veh/h	11		11				98	946			583	580
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774		1579				481	1773			1863	1850
Queue Service Time *(g_s)*, s	0.4		0.4				17.9	17.5			21.9	21.9
Cycle Queue Clearance Time *(g_c)*, s	0.4		0.4				39.7	17.5			21.9	21.9
Capacity *(c)*, veh/h	674		600				217	1844			969	962
Volume-to-Capacity Ratio *(X)*	0.016		0.018				0.451	0.513			0.602	0.602
Available Capacity *(c_a)*, veh/h	674		600				217	1844			969	962
Back of Queue *(Q)*, veh/ln (50th percentile)	0.2		0.2				2.3	6.8			9.4	9.4
Overflow Queue *(Q_3)*, veh/ln	0.0		0.0				0.0	0.0			0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.02		0.02				0.10	0.24			0.48	0.48
Uniform Delay *(d_1)*, s/veh	19.3		19.4				30.7	15.7			16.8	16.8
Incremental Delay *(d_2)*, s/veh	0.0		0.0				5.2	0.8			2.8	2.8
Initial Queue Delay *(d_3)*, s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay *(d)*, s/veh	19.3		19.4				35.8	16.5			19.5	19.6
Level of Service (LOS)	B		B				D	B			B	B
Approach Delay, s/veh / LOS	19.3		B	0.0			18.3		B	19.6		B
Intersection Delay, s/veh / LOS	19.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.7	B	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			1.3	A	1.4	A

HCS 2010 Signalized Intersection Results Summary

I-10 PM Peak Hour

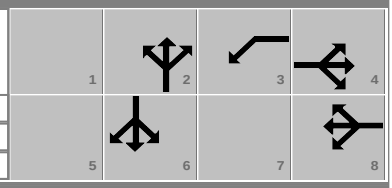
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Cedar Avenue	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I 10)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	90	250	40	140	170	70	20	500	310	60	840	50

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	44.0	8.5	34.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8		2		6
Case Number		6.3	1.0	4.0		6.0		6.0
Phase Duration, s		39.0	12.0	51.0		49.0		49.0
Change Period, *(Y+Rc)*, s		5.0	3.5	5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		3.1	2.8	3.1		0.0		0.0
Queue Clearance Time *(g_s)*, s		8.4	7.2	11.3				
Green Extension Time *(g_e)*, s		1.3	0.0	1.3		0.0		0.0
Phase Call Probability		1.00	1.00	1.00				
Max Out Probability		0.00	1.00	0.00				

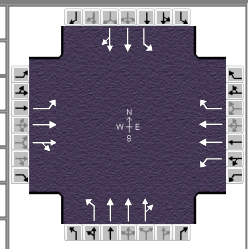
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	98	160	155	152	261		22	543	337	65	489	479
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1114	1863	1773	1774	1770		579	1863	1579	628	1863	1825
Queue Service Time *(g_s)*, s	6.4	6.2	6.3	5.2	9.3		3.0	9.6	15.2	8.3	19.9	19.9
Cycle Queue Clearance Time *(g_c)*, s	6.4	6.2	6.3	5.2	9.3		22.9	9.6	15.2	23.5	19.9	19.9
Capacity *(c)*, veh/h	451	633	603	516	814		211	1639	695	253	820	803
Volume-to-Capacity Ratio *(X)*	0.217	0.252	0.258	0.295	0.320		0.103	0.332	0.485	0.258	0.596	0.596
Available Capacity *(c_a)*, veh/h	451	633	603	516	814		211	1639	695	253	820	803
Back of Queue *(Q)*, veh/ln (50th percentile)	1.6	2.7	2.6	2.1	3.6		0.4	4.0	5.7	1.3	8.6	8.5
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.17	0.27	0.26	0.14	0.25		0.02	0.17	0.24	0.06	0.42	0.41
Uniform Delay *(d_1)*, s/veh	23.9	23.8	23.9	17.3	17.1		29.9	18.4	19.9	28.3	21.3	21.3
Incremental Delay *(d_2)*, s/veh	0.1	0.1	0.1	0.1	0.1		0.7	0.4	1.8	1.3	1.7	1.7
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	24.0	23.9	24.0	17.4	17.2		30.6	18.8	21.7	29.6	22.9	23.0
Level of Service (LOS)	C	C	C	B	B		C	B	C	C	C	C
Approach Delay, s/veh / LOS	23.9	C		17.3	B		20.1	C		23.4	C	
Intersection Delay, s/veh / LOS	21.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	3.1	C	2.7	B	2.4	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	1.0	A	1.3	A

HCS 2010 Signalized Intersection Results Summary

I-11 PM Peak Hour

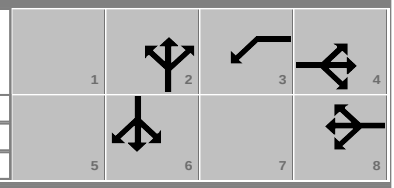
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Carnegie Avenue	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I 11)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	1390	10	150	770	60	50	580	50	80	750	40

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	32.8	7.5	46.2	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	0.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8		2		6
Case Number		6.3	1.0	3.0		6.0		6.0
Phase Duration, s		51.2	11.0	62.2		37.8		37.8
Change Period, *(Y+Rc)*, s		5.0	3.5	5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		3.1	2.8	3.1		0.0		0.0
Queue Clearance Time *(g_s)*, s		39.3	6.5	15.2				
Green Extension Time *(g_e)*, s		4.0	0.0	7.8		0.0		0.0
Phase Call Probability		1.00	1.00	1.00				
Max Out Probability		0.70	1.00	0.03				

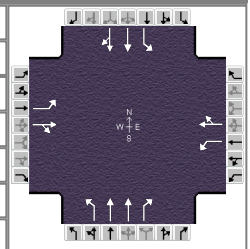
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	76	762	760	163	837	65	54	461	224	87	433	425
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	654	1863	1858	1774	1773	1579	641	1863	1785	754	1863	1829
Queue Service Time *(g_s)*, s	7.4	37.2	37.3	4.5	13.2	1.8	8.1	9.5	9.6	10.0	20.4	20.4
Cycle Queue Clearance Time *(g_c)*, s	9.6	37.2	37.3	4.5	13.2	1.8	28.5	9.5	9.6	19.6	20.4	20.4
Capacity *(c)*, veh/h	360	861	858	236	2029	903	152	1222	585	247	611	600
Volume-to-Capacity Ratio *(X)*	0.212	0.885	0.886	0.692	0.413	0.072	0.358	0.377	0.382	0.353	0.709	0.709
Available Capacity *(c_a)*, veh/h	360	861	858	236	2029	903	152	1222	585	247	611	600
Back of Queue *(Q)*, veh/ln (50th percentile)	1.1	17.8	17.8	2.1	4.8	0.6	1.5	4.2	4.3	2.0	9.6	9.4
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.05	0.56	0.56	0.09	0.14	0.02	0.06	0.17	0.17	0.10	0.49	0.48
Uniform Delay *(d_1)*, s/veh	17.8	24.5	24.5	21.6	12.0	9.6	41.9	25.8	25.8	33.4	29.4	29.4
Incremental Delay *(d_2)*, s/veh	0.1	10.5	10.6	7.1	0.0	0.0	5.7	0.8	1.7	2.6	4.6	4.7
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	17.9	35.0	35.1	28.7	12.0	9.6	47.6	26.6	27.5	36.0	34.0	34.1
Level of Service (LOS)	B	D	D	C	B	A	D	C	C	D	C	C
Approach Delay, s/veh / LOS	34.2	C		14.4	B		28.4	C		34.2	C	
Intersection Delay, s/veh / LOS	28.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	3.1	C	2.9	C	2.8	C
Bicycle LOS Score / LOS	1.8	A	1.4	A	0.9	A	1.3	A

HCS 2010 Signalized Intersection Results Summary

I-12 PM Peak Hour

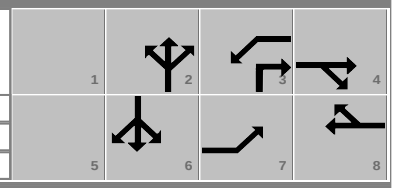
General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Euclid Avenue	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative PM Peak (I 12)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	290	320	90	290	370	20	90	530	110	40	440	230

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	29.0	23.0	28.0	0.0	0.0	0.0
Yellow	3.5	5.0	3.5	0.0	0.0	0.0
Red	1.5	0.0	6.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8		2		6
Case Number	2.0	4.0	2.0	4.0		5.0		6.0
Phase Duration, s	28.0	38.0	28.0	38.0		34.0		34.0
Change Period, *(Y+Rc)*, s	5.0	10.0	5.0	10.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	3.2	2.8	3.2		0.0		0.0
Queue Clearance Time *(g_s)*, s	18.6	25.8	18.6	23.5				
Green Extension Time *(g_e)*, s	0.2	0.6	0.2	1.0		0.0		0.0
Phase Call Probability	1.00	1.00	1.00	1.00				
Max Out Probability	0.26	1.00	0.26	0.62				

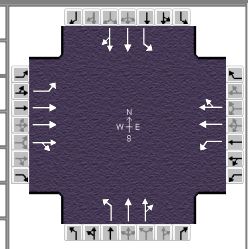
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	315	446		315	424		98	576	120	43	478	250
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1792		1774	1846		724	1773	1579	834	1863	1579
Queue Service Time *(g_s)*, s	16.6	23.8		16.6	21.5		4.5	13.8	3.9	4.7	24.5	13.4
Cycle Queue Clearance Time *(g_c)*, s	16.6	23.8		16.6	21.5		29.0	13.8	3.9	18.4	24.5	13.4
Capacity *(c)*, veh/h	408	502		408	517		104	1029	821	199	540	458
Volume-to-Capacity Ratio *(X)*	0.773	0.888		0.773	0.820		0.937	0.560	0.146	0.219	0.885	0.546
Available Capacity *(c_a)*, veh/h	408	502		408	517		104	1029	821	199	540	458
Back of Queue *(Q)*, veh/ln (50th percentile)	8.1	12.6		8.1	10.9		4.3	6.0	1.4	1.1	13.3	5.5
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.41	0.64		0.39	0.53		0.18	0.25	0.06	0.06	0.75	0.31
Uniform Delay *(d_1)*, s/veh	36.1	34.5		36.1	33.6		49.3	30.1	12.5	37.9	33.9	29.9
Incremental Delay *(d_2)*, s/veh	8.1	16.9		8.1	9.5		65.8	1.9	0.3	2.3	17.3	4.2
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	44.1	51.4		44.1	43.2		115.0	32.0	12.8	40.2	51.2	34.1
Level of Service (LOS)	D	D		D	D		F	C	B	D	D	C
Approach Delay, s/veh / LOS	48.4	D		43.6	D		39.3	D		45.1	D	
Intersection Delay, s/veh / LOS	44.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.7	A	1.7	A	1.1	A	1.1	A

HCS 2010 Signalized Intersection Results Summary

I-13 PM Peak Hour

General Information				Intersection Information	
Agency	HNTB			Duration, h	0.25
Analyst	TVF	Analysis Date	May 9, 2012	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	Chester Avenue	Analysis Year	2020	Analysis Period	1> 17:00
File Name					
Project Description	Recommended Preferred Alternative (I 13)				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	90	1400	110	10	500	30	50	730	90	40	560	100

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	43.3	6.5	36.7	0.0	0.0	0.0	5	6	7	8
Yellow	3.5	3.5	3.5	0.0	0.0	0.0				
Red	1.5	0.0	1.5	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8		2		6
Case Number	1.0	4.0		6.3		6.0		6.0
Phase Duration, s	10.0	51.7		41.7		48.3		48.3
Change Period, *(Y+Rc)*, s	3.5	5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s	2.8	3.1		3.1		0.0		0.0
Queue Clearance Time *(g_s)*, s	5.2	24.6		17.4				
Green Extension Time *(g_e)*, s	0.0	6.0		5.8		0.0		0.0
Phase Call Probability	1.00	1.00		1.00				
Max Out Probability	1.00	0.10		0.14				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h	98	1108	533	11	290	286	54	454	437	43	368	350
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1774	1863	1790	304	1863	1825	731	1863	1791	621	1863	1764
Queue Service Time *(g_s)*, s	3.2	22.6	22.6	2.8	11.7	11.7	5.7	18.3	18.3	5.6	14.0	14.0
Cycle Queue Clearance Time *(g_c)*, s	3.2	22.6	22.6	15.4	11.7	11.7	19.7	18.3	18.3	23.9	14.0	14.0
Capacity *(c)*, veh/h	395	1740	836	145	684	670	286	807	775	227	807	764
Volume-to-Capacity Ratio *(X)*	0.247	0.637	0.637	0.075	0.425	0.426	0.190	0.563	0.564	0.191	0.456	0.458
Available Capacity *(c_a)*, veh/h	395	1740	836	145	684	670	286	807	775	227	807	764
Back of Queue *(Q)*, veh/ln (50th percentile)	1.3	9.4	9.2	0.2	5.0	4.9	1.1	8.0	7.7	0.9	6.2	5.9
Overflow Queue *(Q_3)*, veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.05	0.40	0.39	0.01	0.18	0.17	0.05	0.41	0.39	0.06	0.39	0.38
Uniform Delay *(d_1)*, s/veh	17.0	20.2	20.2	29.9	23.7	23.8	27.0	21.3	21.3	30.2	20.0	20.0
Incremental Delay *(d_2)*, s/veh	0.1	0.6	1.3	0.1	0.2	0.2	1.0	2.0	2.1	1.9	1.9	2.0
Initial Queue Delay *(d_3)*, s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	17.1	20.8	21.5	29.9	23.9	23.9	28.1	23.3	23.4	32.1	21.9	22.0
Level of Service (LOS)	B	C	C	C	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	20.8	C		24.0	C		23.6	C		22.5	C	
Intersection Delay, s/veh / LOS	22.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.8	C	2.8	C	3.2	C	2.9	C
Bicycle LOS Score / LOS	1.4	A	1.0	A	1.3	A	1.1	A

Appendix F: Synchro Analysis Results - Signalized Intersections (2020 AM Peak Hour)

Synchro Analysis – AM Peak Hour 2020 Build Condition

The roadway network established from HCS analyses was modeled using Synchro to determine operations with optimized signal coordination along the corridor for the AM and PM peak hours. However, it should be noted that within the University Circle Area several of the corridors intersected by the proposed boulevard also have coordinated signal systems (i.e. Carnegie Avenue, Euclid Avenue, Chester Avenue, etc.). These corridors accommodate the predominant east-west traffic movements within University Circle. Therefore, the optimized timings developed as part of this Synchro analysis will have to be further evaluated based on city-wide signal coordination goals and further field adjusted to achieve optimal system performance.

Synchro results for the proposed boulevard indicate intersection levels of service range from LOS A to LOS C during the AM peak hour. The 79th Street and Euclid Avenue intersections each have one movement that operates below acceptable levels.

At the E. 79th Street, the southbound through lane operates at a LOS E with a delay of 57.1 seconds during the AM peak hour. The phasing used in the analysis for the AM peak hour is controlled by the phasing required for the PM to operate with acceptable conditions which includes a protected northbound phase. The protected northbound is not required during the AM peak hour. Based on the low southbound opposing volumes (180 vehicles in one shared lane), long split, low v/c ratio of 0.68, and acceptable results from the HCS analyses, further changes to this intersection are not recommended.

At Euclid Avenue, the eastbound left turn movement operates at a LOS E with a delay of 62.9 seconds and a v/c ratio of 0.70. Euclid Avenue currently operates as a BRT corridor and creates a constraint when designing E. 105th Street to meet the operational requirements of the project. Synchro has limitations in modeling this intersection. To accommodate the protected bus movements, a "dummy" phase of 6.5 seconds was added to the eastbound and westbound left turn movements. This may have resulted in a conservative result. The hourly volume for this movement is 160 vehicles. The eastbound left turn lane length is designed to remain as it currently exists at 150 feet. Due to the BRT condition, it cannot be extended without excessive impacts to the intersection area. There are several east-west roadways that intersect with E. 105th Street and provide alternate routes Given the limitations of the analysis methodology, the overall operation of the intersection (LOS D), the low v/c ratio (0.70), and the geometric constraints, further changes to this intersection are not recommended.

Synchro results for the AM peak hour are included within this Appendix.

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	260	200	1030	320	120	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	440	0		0	400	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.964			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	1531	3298	0	1711	3421
Flt Permitted	0.950				0.091	
Satd. Flow (perm)	1711	1531	3298	0	164	3421
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	25		35			35
Link Distance (ft)	714		708			1413
Travel Time (s)	19.5		13.8			27.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	217	1120	348	130	272
Shared Lane Traffic (%)						
Lane Group Flow (vph)	283	217	1468	0	130	272
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	22		11			11
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	1		1	1
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	35	35	35		35	35
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	35	35	35		35	35
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Turn Type		pm+ov			pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8			6	
Detector Phase	8	1	2		1	6
Switch Phase						
Minimum Initial (s)	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	31.0	11.0	29.0		11.0	11.0
Total Split (s)	39.0	16.0	65.0	0.0	16.0	81.0
Total Split (%)	32.5%	13.3%	54.2%	0.0%	13.3%	67.5%

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Maximum Green (s)	34.0	11.0	60.0		11.0	76.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	5.0	5.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	19.0		17.0			
Pedestrian Calls (#/hr)	8		8			
Act Effct Green (s)	25.1	39.5	70.5		84.9	84.9
Actuated g/C Ratio	0.21	0.33	0.59		0.71	0.71
v/c Ratio	0.79	0.43	0.76		0.55	0.11
Control Delay	49.0	36.4	23.3		18.5	6.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	49.0	36.4	23.3		18.5	6.4
LOS	D	D	C		B	A
Approach Delay	43.5		23.3			10.3
Approach LOS	D		C			B

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 105 (88%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 25.4		Intersection LOS: C	
Intersection Capacity Utilization 72.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 1: Quadrant & E. 55th St

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1800	260	200	1300	220	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	625		300	0
Storage Lanes		0	1		2	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	0.91	0.91	1.00	0.95	0.97	1.00
Frt	0.981					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	4822	0	1711	3421	3319	1531
Flt Permitted			0.052		0.950	
Satd. Flow (perm)	4822	0	94	3421	3319	1531
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	35			35	25	
Link Distance (ft)	1145			1919	714	
Travel Time (s)	22.3			37.4	19.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1957	283	217	1413	239	239
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2240	0	217	1413	239	239
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	22	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)		9	15		15	9
Number of Detectors	1		1	1	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	35		35	35	35	35
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	35		35	35	35	35
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type			pm+pt			pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	6.0	6.0
Minimum Split (s)	32.0		11.0	11.0	11.0	11.0
Total Split (s)	76.0	0.0	25.0	101.0	19.0	25.0
Total Split (%)	63.3%	0.0%	20.8%	84.2%	15.8%	20.8%

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Maximum Green (s)	71.0		20.0	96.0	14.0	20.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.5		1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Walk Time (s)	7.0					
Flash Dont Walk (s)	20.0					
Pedestrian Calls (#/hr)	8					
Act Effct Green (s)	72.2		97.2	97.2	12.8	37.8
Actuated g/C Ratio	0.60		0.81	0.81	0.11	0.32
v/c Ratio	0.77		0.63	0.51	0.67	0.49
Control Delay	20.4		33.5	4.7	48.3	25.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	20.4		33.5	4.7	48.3	25.0
LOS	C		C	A	D	C
Approach Delay	20.4			8.6	36.7	
Approach LOS	C			A	D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 88 (73%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 70.4%		ICU Level of Service C	
Analysis Period (min) 15			

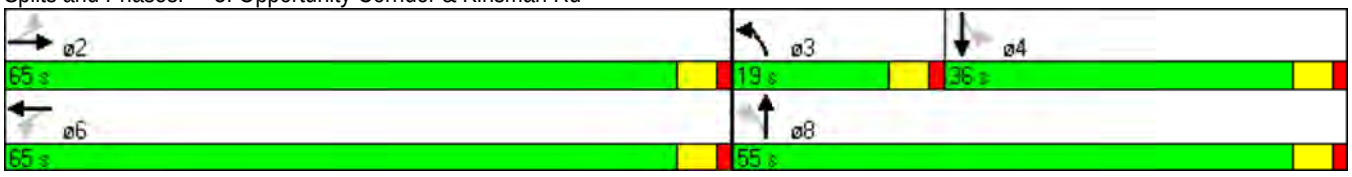
Splits and Phases: 2: Opportunity Corridor & Quadrant

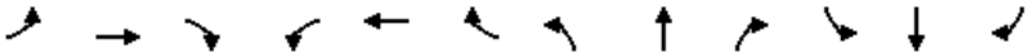
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1840	170	10	1230	10	250	300	10	10	120	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	340		0	150		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.987			0.999			0.995			0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4852	0	1711	3418	0	1711	3404	0	1711	3346	0
Flt Permitted	0.141			0.052			0.485			0.549		
Satd. Flow (perm)	254	4852	0	94	3418	0	873	3404	0	989	3346	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1919			2120			705			713	
Travel Time (s)		37.4			41.3			13.7			13.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	2000	185	11	1337	11	272	326	11	11	130	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	2185	0	11	1348	0	272	337	0	11	152	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		2			6		3	8			4	
Permitted Phases	2			6			8	8		4		
Detector Phase	2	2		6	6		3	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		12.0	36.0		36.0	36.0	
Total Split (s)	65.0	65.0	0.0	65.0	65.0	0.0	19.0	55.0	0.0	36.0	36.0	0.0
Total Split (%)	54.2%	54.2%	0.0%	54.2%	54.2%	0.0%	15.8%	45.8%	0.0%	30.0%	30.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	60.0	60.0		60.0	60.0		14.0	50.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8			8		8	8	
Act Effct Green (s)	76.8	76.8		76.8	76.8		33.2	33.2		14.2	14.2	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.28	0.28		0.12	0.12	
v/c Ratio	0.07	0.70		0.18	0.62		0.80	0.36		0.09	0.38	
Control Delay	5.8	7.8		24.1	15.6		54.7	34.9		43.5	49.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.8	7.8		24.1	15.6		54.7	34.9		43.5	49.7	
LOS	A	A		C	B		D	C		D	D	
Approach Delay		7.8			15.6			43.7			49.3	
Approach LOS		A			B			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 16.9		Intersection LOS: B	
Intersection Capacity Utilization 70.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Opportunity Corridor & Kinsman Rd



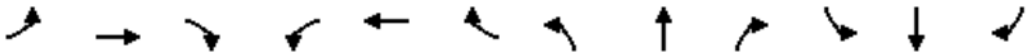


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1810	10	10	1230	10	10	40	20	10	10	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	450		0	150		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.999			0.949			0.900	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4911	0	1711	3418	0	1711	1709	0	1711	1621	0
Flt Permitted	0.183			0.087			0.736			0.715		
Satd. Flow (perm)	330	4911	0	157	3418	0	1325	1709	0	1287	1621	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		2120			925			700			775	
Travel Time (s)		41.3			18.0			19.1			21.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1967	11	11	1337	11	11	43	22	11	11	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	1978	0	11	1348	0	11	65	0	11	33	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		36.0	36.0		36.0	36.0	
Total Split (s)	84.0	84.0	0.0	84.0	84.0	0.0	36.0	36.0	0.0	36.0	36.0	0.0
Total Split (%)	70.0%	70.0%	0.0%	70.0%	70.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	79.0	79.0		79.0	79.0		31.0	31.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		24.0	24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8		8	8		8	8	
Act Effct Green (s)	99.9	99.9		99.9	99.9		13.3	13.3		13.3	13.3	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11		0.11	0.11	
v/c Ratio	0.16	0.48		0.08	0.47		0.07	0.34		0.08	0.18	
Control Delay	0.9	0.3		6.3	3.6		42.9	50.9		43.0	46.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	0.9	0.3		6.3	3.6		42.9	50.9		43.0	46.3	
LOS	A	A		A	A		D	D		D	D	
Approach Delay		0.3			3.6			49.7			45.5	
Approach LOS		A			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 45 (38%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 3.3		Intersection LOS: A	
Intersection Capacity Utilization 50.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 4: Opportunity Corridor & E. 75th St

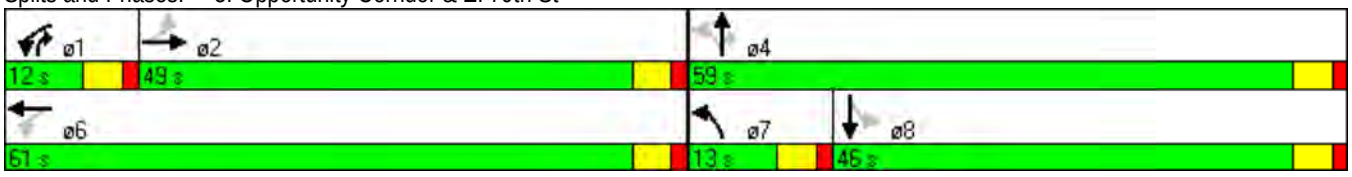


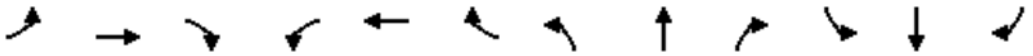
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1670	140	90	1080	10	110	330	140	10	110	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		0	725		0	400		400	400		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988			0.999				0.850		0.942	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4857	0	1711	3418	0	1711	1801	1531	1711	1696	0
Flt Permitted	0.222			0.059			0.329			0.450		
Satd. Flow (perm)	400	4857	0	106	3418	0	592	1801	1531	810	1696	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		925			2311			781			663	
Travel Time (s)		18.0			45.0			21.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1815	152	98	1174	11	120	359	152	11	120	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	1967	0	98	1185	0	120	359	152	11	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	1	1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35	35	35	35	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	35	35		35	35		35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Perm			pm+pt			pm+pt		pm+ov	Perm		
Protected Phases		2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		1	6		7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	32.0	32.0		11.0	32.0		12.0	36.0	11.0	36.0	36.0	
Total Split (s)	49.0	49.0	0.0	12.0	61.0	0.0	13.0	59.0	12.0	46.0	46.0	0.0
Total Split (%)	40.8%	40.8%	0.0%	10.0%	50.8%	0.0%	10.8%	49.2%	10.0%	38.3%	38.3%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	44.0	44.0		7.0	56.0		8.0	54.0	7.0	41.0	41.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8			8			8		8	8	
Act Effct Green (s)	63.1	63.1		76.7	76.7		33.3	33.3	46.9	20.3	20.3	
Actuated g/C Ratio	0.53	0.53		0.64	0.64		0.28	0.28	0.39	0.17	0.17	
v/c Ratio	0.20	0.77		0.54	0.54		0.50	0.72	0.25	0.08	0.68	
Control Delay	5.2	10.1		26.5	9.4		39.7	47.0	24.2	39.1	58.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	5.2	10.1		26.5	9.4		39.7	47.0	24.2	39.1	58.1	
LOS	A	B		C	A		D	D	C	D	E	
Approach Delay		10.0			10.7			40.1			57.1	
Approach LOS		A			B			D			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 60 (50%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 17.2		Intersection LOS: B	
Intersection Capacity Utilization 79.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: Opportunity Corridor & E. 79th St





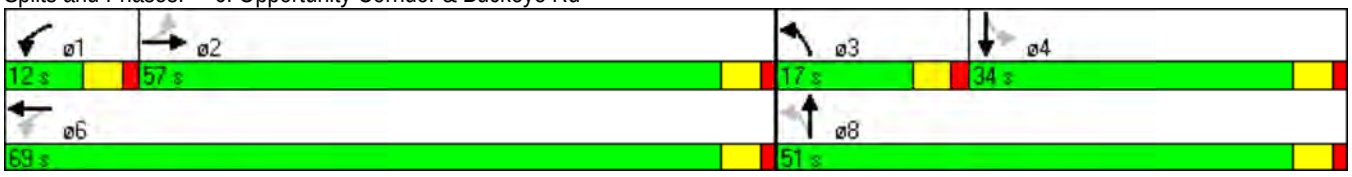
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1720	80	40	960	10	210	640	270	10	420	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	290		0	425		0	225		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.993			0.998			0.956			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4881	0	1711	3414	0	1711	3271	0	1711	3408	0
Flt Permitted	0.236			0.064			0.238			0.174		
Satd. Flow (perm)	425	4881	0	115	3414	0	429	3271	0	313	3408	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		2311			651			862			1038	
Travel Time (s)		45.0			12.7			16.8			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	1870	87	43	1043	11	228	696	293	11	457	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	1957	0	43	1054	0	228	989	0	11	468	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			pm+pt			pm+pt			Perm		
Protected Phases		2		1	6		3	8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		3	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		12.0	32.0		12.0	36.0		36.0	36.0	
Total Split (s)	57.0	57.0	0.0	12.0	69.0	0.0	17.0	51.0	0.0	34.0	34.0	0.0
Total Split (%)	47.5%	47.5%	0.0%	10.0%	57.5%	0.0%	14.2%	42.5%	0.0%	28.3%	28.3%	0.0%

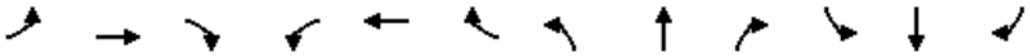
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	52.0	52.0		7.0	64.0		12.0	46.0		29.0	29.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead			Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes			Yes					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8			8			8		8	8	
Act Effct Green (s)	58.8	58.8		68.3	68.3		41.7	41.7		24.7	24.7	
Actuated g/C Ratio	0.49	0.49		0.57	0.57		0.35	0.35		0.21	0.21	
v/c Ratio	0.05	0.82		0.28	0.54		0.82	0.87		0.17	0.67	
Control Delay	5.6	20.2		17.1	23.8		53.9	45.7		43.9	48.4	
Queue Delay	0.0	0.0		0.0	0.3		0.0	0.0		0.0	0.0	
Total Delay	5.6	20.2		17.1	24.1		53.9	45.7		43.9	48.4	
LOS	A	C		B	C		D	D		D	D	
Approach Delay		20.1			23.8			47.2			48.3	
Approach LOS		C			C			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 30.7 Intersection LOS: C
Intersection Capacity Utilization 78.8% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 6: Opportunity Corridor & Buckeye Rd





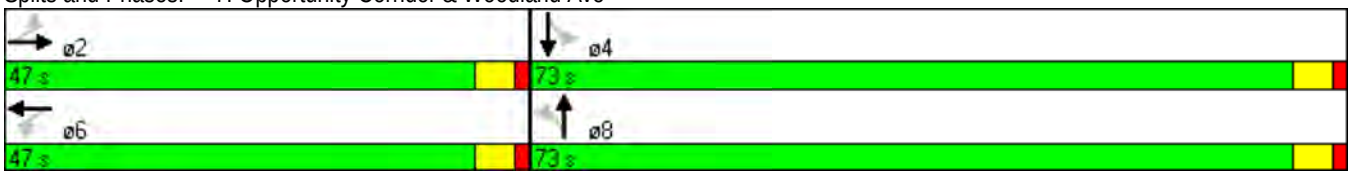
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1820	170	10	770	20	230	190	10	90	190	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	315		0	650		0	375		0	225		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.987			0.996			0.992			0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4852	0	1711	3408	0	1711	3394	0	1711	3394	0
Flt Permitted	0.285			0.053			0.602			0.602		
Satd. Flow (perm)	513	4852	0	95	3408	0	1084	3394	0	1084	3394	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		651			1033			944			1183	
Travel Time (s)		12.7			20.1			18.4			23.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	1978	185	11	837	22	250	207	11	98	207	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	2163	0	11	859	0	250	218	0	98	218	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2	2		6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		36.0	36.0		36.0	36.0	
Total Split (s)	47.0	47.0	0.0	47.0	47.0	0.0	73.0	73.0	0.0	73.0	73.0	0.0
Total Split (%)	39.2%	39.2%	0.0%	39.2%	39.2%	0.0%	60.8%	60.8%	0.0%	60.8%	60.8%	0.0%

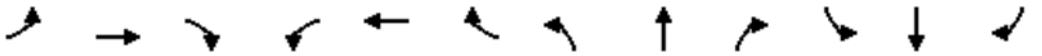
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	42.0	42.0		42.0	42.0		68.0	68.0		68.0	68.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		24.0	24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8		8	8		8	8	
Act Effct Green (s)	74.8	74.8		74.8	74.8		35.2	35.2		35.2	35.2	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.29	0.29		0.29	0.29	
v/c Ratio	0.03	0.72		0.19	0.40		0.79	0.22		0.31	0.22	
Control Delay	23.5	26.7		38.6	25.0		54.8	30.6		32.7	30.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.5	26.7		38.6	25.0		54.8	30.6		32.7	30.6	
LOS	C	C		D	C		D	C		C	C	
Approach Delay		26.7			25.2			43.6			31.2	
Approach LOS		C			C			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 96 (80%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 28.8 Intersection LOS: C
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Opportunity Corridor & Woodland Ave



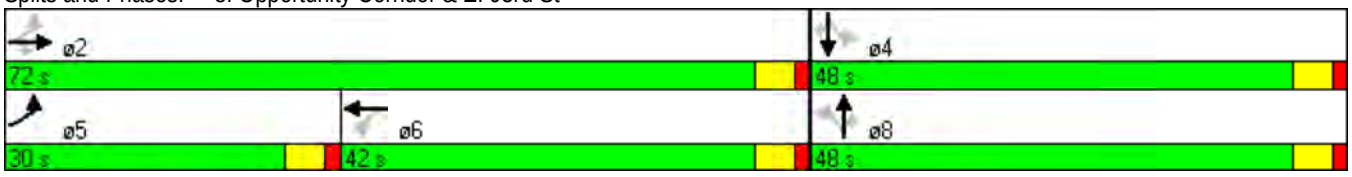


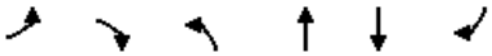
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	430	1480	10	40	580	10	10	410	200	10	230	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	460		0	500		0	190		190	290		240
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.997				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3421	1531	1711	3411	0	1711	1801	1531	1711	1801	1531
Flt Permitted	0.265			0.139			0.454			0.174		
Satd. Flow (perm)	477	3421	1531	250	3411	0	817	1801	1531	313	1801	1531
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		1033			2188			492			838	
Travel Time (s)		20.1			42.6			11.2			22.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	467	1609	11	43	630	11	11	446	217	11	250	239
Shared Lane Traffic (%)												
Lane Group Flow (vph)	467	1609	11	43	641	0	11	446	217	11	250	239
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	35	35	35	35	35		35	35	35	35	35	35
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	35	35	35	35	35		35	35	35	35	35	35
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt		Perm	Perm			Perm		Perm	Perm		Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6			8		8	4		4
Detector Phase	5	2	2	6	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	12.0	32.0	32.0	32.0	32.0		36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	30.0	72.0	72.0	42.0	42.0	0.0	48.0	48.0	48.0	48.0	48.0	48.0
Total Split (%)	25.0%	60.0%	60.0%	35.0%	35.0%	0.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	25.0	67.0	67.0	37.0	37.0		43.0	43.0	43.0	43.0	43.0	43.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max		None	None	None	None	None	None
Walk Time (s)		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		20.0	20.0	20.0	20.0		24.0	24.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)		8	8	8	8		8	8	8	8	8	8
Act Effct Green (s)	74.9	74.9	74.9	44.5	44.5		35.1	35.1	35.1	35.1	35.1	35.1
Actuated g/C Ratio	0.62	0.62	0.62	0.37	0.37		0.29	0.29	0.29	0.29	0.29	0.29
v/c Ratio	0.84	0.75	0.01	0.46	0.51		0.05	0.85	0.48	0.12	0.47	0.53
Control Delay	27.6	8.3	1.9	44.7	21.0		27.5	54.6	37.7	31.2	36.9	39.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.6	8.3	1.9	44.7	21.0		27.5	54.6	37.7	31.2	36.9	39.1
LOS	C	A	A	D	C		C	D	D	C	D	D
Approach Delay		12.6			22.5			48.7			37.8	
Approach LOS		B			C			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 3 (3%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 23.7		Intersection LOS: C	
Intersection Capacity Utilization 80.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 8: Opportunity Corridor & E. 93rd St



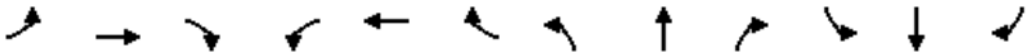


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	10	130	1550	610	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	600			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.998	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1711	1531	1711	3421	3414	0
Flt Permitted	0.950		0.395			
Satd. Flow (perm)	1711	1531	711	3421	3414	0
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	35			35	30	
Link Distance (ft)	1147			2188	1451	
Travel Time (s)	22.3			42.6	33.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	11	141	1685	663	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	11	11	141	1685	674	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			12	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane					Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	
Detector Template	Left	Right	Left	Thru	Thru	
Leading Detector (ft)	35	35	35	35	35	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Turn Type		custom	Perm			
Protected Phases				2	6	
Permitted Phases	4	4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	32.0	32.0	32.0	32.0	24.0	
Total Split (s)	32.0	32.0	88.0	88.0	88.0	0.0
Total Split (%)	26.7%	26.7%	73.3%	73.3%	73.3%	0.0%

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Maximum Green (s)	27.0	27.0	83.0	83.0	83.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	11.0	
Pedestrian Calls (#/hr)	8	8	8	8	8	
Act Effct Green (s)	10.5	10.5	105.9	105.9	105.9	
Actuated g/C Ratio	0.09	0.09	0.88	0.88	0.88	
v/c Ratio	0.07	0.08	0.22	0.56	0.22	
Control Delay	46.1	46.5	3.6	3.3	0.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	46.1	46.5	3.6	3.3	0.9	
LOS	D	D	A	A	A	
Approach Delay	46.3			3.3	0.9	
Approach LOS	D			A	A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 32 (27%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 3.0		Intersection LOS: A	
Intersection Capacity Utilization 56.2%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 9: Quincy Ave &

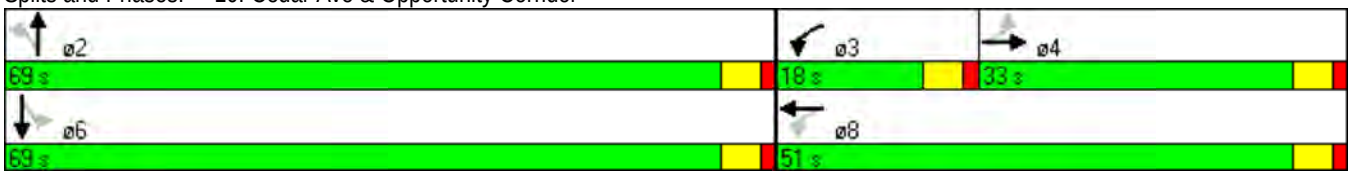


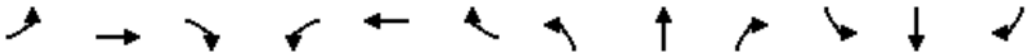
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	310	10	140	180	100	30	1050	420	30	460	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	255		0	350		0	600		0	325		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.95	0.95
Frt		0.995			0.946			0.957			0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3404	0	1711	1703	0	1711	4704	0	1711	3353	0
Flt Permitted	0.574			0.279			0.410			0.113		
Satd. Flow (perm)	1034	3404	0	502	1703	0	738	4704	0	203	3353	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			30			35	
Link Distance (ft)		1015			1164			668			652	
Travel Time (s)		19.8			22.7			15.2			12.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	337	11	152	196	109	33	1141	457	33	500	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	348	0	152	305	0	33	1598	0	33	576	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes						Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		12.0	32.0		24.0	24.0		32.0	32.0	
Total Split (s)	33.0	33.0	0.0	18.0	51.0	0.0	69.0	69.0	0.0	69.0	69.0	0.0
Total Split (%)	27.5%	27.5%	0.0%	15.0%	42.5%	0.0%	57.5%	57.5%	0.0%	57.5%	57.5%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	28.0	28.0		13.0	46.0		64.0	64.0		64.0	64.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0		11.0	11.0		20.0	20.0	
Pedestrian Calls (#/hr)	8	8			8		8	8		8	8	
Act Effct Green (s)	18.5	18.5		35.6	35.6		74.4	74.4		74.4	74.4	
Actuated g/C Ratio	0.15	0.15		0.30	0.30		0.62	0.62		0.62	0.62	
v/c Ratio	0.47	0.66		0.56	0.60		0.07	0.55		0.26	0.28	
Control Delay	54.9	53.5		39.6	40.7		5.6	6.7		35.3	23.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	54.9	53.5		39.6	40.7		5.6	6.7		35.3	23.6	
LOS	D	D		D	D		A	A		D	C	
Approach Delay		53.7			40.3			6.7			24.2	
Approach LOS		D			D			A			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 87 (73%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 21.4		Intersection LOS: C	
Intersection Capacity Utilization 62.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 10: Cedar Ave & Opportunity Corridor



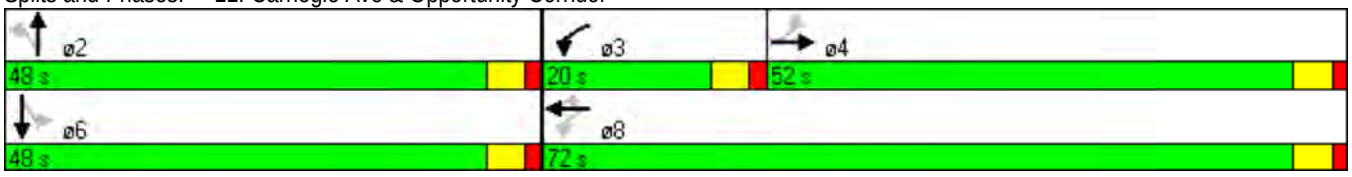


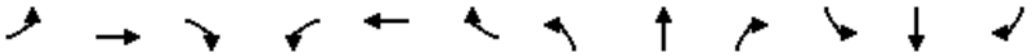
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	530	30	180	1530	110	50	1050	20	40	380	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	625		0	250		640	150		0	500		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.91	0.91	1.00	0.95	0.95
Frt		0.992				0.850		0.997			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3394	0	1711	3421	1531	1711	4901	0	1711	3408	0
Flt Permitted	0.084			0.297			0.440			0.136		
Satd. Flow (perm)	151	3394	0	535	3421	1531	792	4901	0	245	3408	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1245			1288			652			918	
Travel Time (s)		24.3			25.1			12.7			17.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	576	33	196	1663	120	54	1141	22	43	413	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	609	0	196	1663	120	54	1163	0	43	424	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes			Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35	35	35	35		35	35	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	35	35		35	35	35	35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm			pm+pt		Perm	Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		3	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		12.0	32.0	32.0	36.0	36.0		32.0	32.0	
Total Split (s)	52.0	52.0	0.0	20.0	72.0	72.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	43.3%	43.3%	0.0%	16.7%	60.0%	60.0%	40.0%	40.0%	0.0%	40.0%	40.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	47.0	47.0		15.0	67.0	67.0	43.0	43.0		43.0	43.0	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?				Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0	20.0	24.0	24.0		20.0	20.0	
Pedestrian Calls (#/hr)	8	8			8	8	8	8		8	8	
Act Effct Green (s)	47.8	47.8		65.4	65.4	65.4	44.6	44.6		44.6	44.6	
Actuated g/C Ratio	0.40	0.40		0.54	0.54	0.54	0.37	0.37		0.37	0.37	
v/c Ratio	0.18	0.45		0.47	0.89	0.14	0.18	0.64		0.47	0.33	
Control Delay	32.9	27.8		17.7	31.4	13.6	29.1	37.2		49.6	29.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	32.9	27.8		17.7	31.4	13.6	29.1	37.2		49.6	29.7	
LOS	C	C		B	C	B	C	D		D	C	
Approach Delay		27.9			29.0			36.8			31.5	
Approach LOS		C			C			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 31.3		Intersection LOS: C	
Intersection Capacity Utilization 89.7%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 11: Carnegie Ave & Opportunity Corridor



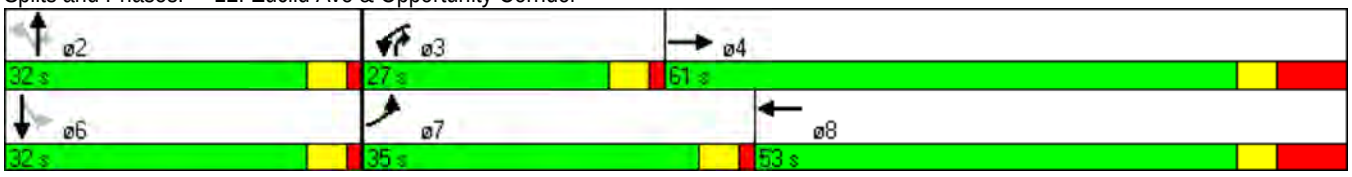


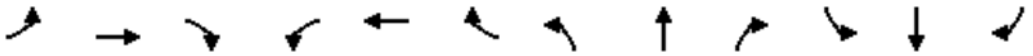
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	300	60	40	410	20	90	520	480	10	310	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	525		0	350		0	225		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt		0.975			0.993				0.850		0.932	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	1756	0	1711	1788	0	1711	3421	1531	1711	3189	0
Flt Permitted	0.950			0.950			0.313			0.347		
Satd. Flow (perm)	1711	1756	0	1711	1788	0	564	3421	1531	625	3189	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1124			935			918			658	
Travel Time (s)		30.7			25.5			17.9			12.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	326	65	43	446	22	98	565	522	11	337	283
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	391	0	43	468	0	98	565	522	11	620	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	1	1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35	35	35	35	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	35	35		35	35		35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot			Prot			Perm		pm+ov	Perm		
Protected Phases	7	4		3	8			2	3		6	
Permitted Phases							2		2	6		
Detector Phase	7	4		3	8		2	2	3	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	11.0	37.0		11.0	37.0		32.0	32.0	11.0	32.0	32.0	
Total Split (s)	35.0	61.0	0.0	27.0	53.0	0.0	32.0	32.0	27.0	32.0	32.0	0.0
Total Split (%)	29.2%	50.8%	0.0%	22.5%	44.2%	0.0%	26.7%	26.7%	22.5%	26.7%	26.7%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	30.0	51.0		22.0	43.0		27.0	27.0	22.0	27.0	27.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	6.5		1.5	6.5		1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	10.0	4.0	5.0	10.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			
Lead-Lag Optimize?				Yes					Yes			
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max	None	C-Max	C-Max	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		8			8		8	8		8	8	
Act Effct Green (s)	17.5	37.0		17.0	36.6		45.9	45.9	68.0	45.9	45.9	
Actuated g/C Ratio	0.15	0.31		0.14	0.30		0.38	0.38	0.57	0.38	0.38	
v/c Ratio	0.70	0.72		0.18	0.86		0.45	0.43	0.60	0.05	0.51	
Control Delay	62.9	44.5		44.3	54.8		37.7	28.3	11.0	28.0	24.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	62.9	44.5		44.3	54.8		37.7	28.3	11.0	28.0	24.4	
LOS	E	D		D	D		D	C	B	C	C	
Approach Delay		50.1			53.9			21.5			24.5	
Approach LOS		D			D			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 113 (94%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 33.4		Intersection LOS: C	
Intersection Capacity Utilization 74.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 12: Euclid Ave & Opportunity Corridor





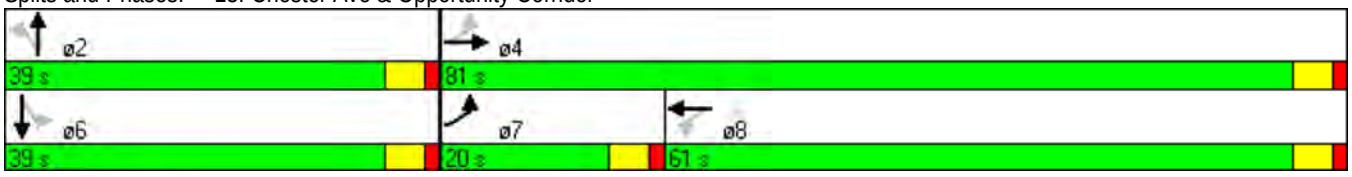
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	510	90	10	1120	90	90	530	30	40	460	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	600		0	340		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.977			0.989			0.992			0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4803	0	1711	3384	0	1711	3394	0	1711	3411	0
Flt Permitted	0.069			0.393			0.348			0.279		
Satd. Flow (perm)	124	4803	0	708	3384	0	627	3394	0	502	3411	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1230			1070			658			1379	
Travel Time (s)		24.0			20.8			12.8			26.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	185	554	98	11	1217	98	98	576	33	43	500	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	185	652	0	11	1315	0	98	609	0	43	511	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	32.0		32.0	32.0		32.0	32.0		32.0	32.0	
Total Split (s)	20.0	81.0	0.0	61.0	61.0	0.0	39.0	39.0	0.0	39.0	39.0	0.0
Total Split (%)	16.7%	67.5%	0.0%	50.8%	50.8%	0.0%	32.5%	32.5%	0.0%	32.5%	32.5%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	15.0	76.0		56.0	56.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		8		8	8		8	8		8	8	
Act Effct Green (s)	72.0	72.0		52.8	52.8		38.0	38.0		38.0	38.0	
Actuated g/C Ratio	0.60	0.60		0.44	0.44		0.32	0.32		0.32	0.32	
v/c Ratio	0.70	0.23		0.04	0.88		0.49	0.57		0.27	0.47	
Control Delay	40.5	11.0		18.1	38.7		37.6	31.0		39.0	35.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.5	11.0		18.1	38.7		37.6	31.0		39.0	35.8	
LOS	D	B		B	D		D	C		D	D	
Approach Delay		17.5			38.6			31.9			36.0	
Approach LOS		B			D			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 31.6 Intersection LOS: C
Intersection Capacity Utilization 80.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 13: Chester Ave & Opportunity Corridor



Appendix G: Synchro Analysis Results - Signalized Intersections (2020 PM Peak Hour)

Synchro Analysis – PM Peak Hour 2020 Build Condition

The roadway network established from HCS analyses was modeled using Synchro to determine operations with optimized signal coordination along the corridor for the AM and PM peak hours. However, it should be noted that within the University Circle area several of the corridors intersected by the proposed boulevard also have coordinated signal systems (i.e. Carnegie Avenue, Euclid Avenue, Chester Avenue, etc.). These corridors accommodate the predominant east-west traffic movements within University Circle. Therefore, the optimized timings developed as part of this Synchro analysis will have to be further evaluated based on city-wide signal coordination goals and further field adjusted to achieve optimal system performance.

Synchro results for the proposed boulevard indicate intersection levels of service range from LOS A to LOS D during the PM peak hour. The Carnegie and Euclid intersections each have movements that operate below acceptable levels.

At Carnegie Avenue, the eastbound through movement operates with a v/c ratio of 0.99. Operations for the eastbound through movement would improve with an additional eastbound through lane. However, this widening would create additional impacts. Widening of Carnegie could impact Cleveland Clinic owned structures west of E. 105th Street. East of E. 105th Street, the additional eastbound lane would impact the National Register of Historic Places (NRHP) listed Tudor Arms building. However, even with the high v/c ratio, both the eastbound through movement and the overall intersection operate at LOS D. Given the above, the incremental operational improvement provided by an additional through lane would not be justified given the magnitude of the resulting property impacts.

In addition, the northbound left turn movement at the Carnegie Avenue intersection operates at a LOS E with a delay of 68.7 seconds. The northbound left turn volume is low (50 vehicles). The operational concerns will be mitigated by providing a turn lane that is 325 feet. This will accommodate storage, deceleration, and taper for the left turning vehicles and some additional length for through back up (see **Section 3.3** in the main report text). In addition, there are several east-west roadways that intersect E. 105th Street and provide alternate routes. Based on the low northbound left volumes, the low v/c ratio (0.70), provided storage, and acceptable results from the HCS analyses, further changes to this intersection are not recommended.

At Euclid Avenue, the eastbound through movement operates with a v/c ratio of 0.92 and a LOS E with a delay of 60.6 seconds. Euclid Avenue currently operates as a Bus Rapid Transit (BRT) corridor. It was constructed in 2008 and creates a constraint when designing E. 105th Street to meet the operational requirements of the project. Synchro has limitations in modeling this intersection. To accommodate the protected bus movements, a “dummy” phase of 6.5 seconds was added to the eastbound and westbound left turn movements. This may have resulted in a conservative result. Furthermore, additional widening along Euclid Avenue would result in impacts to the BRT corridor that would substantially increase project costs.

The northbound left movement at Euclid Avenue also operates with a v/c ratio of 0.93 and a LOS F with a delay of 93.7. However, the northbound left turn volume is low (90 vehicles). Operational concerns will be mitigated by providing a turn lane that is 400 feet to accommodate storage, deceleration, taper, and through back up (see **Section 3.3**). In addition, there are several east-west roadways that intersect with E. 105th Street and provide alternate routes to Euclid Avenue. Given the limitations in the analysis methodology, the overall operation of the intersection (LOS D), the low NB turning volume, and the

provided NB storage, and the prohibitive impacts of additional eastbound lanes, further changes to this intersection are not recommended.

Synchro results for the PM peak hour are included within this Appendix.

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	120	120	240	170	240	1290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	440	0		0	400	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25	25		25	25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.938			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	1531	3209	0	1711	3421
Flt Permitted	0.950				0.448	
Satd. Flow (perm)	1711	1531	3209	0	807	3421
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	25		35			35
Link Distance (ft)	714		708			1413
Travel Time (s)	19.5		13.8			27.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	130	261	185	261	1402
Shared Lane Traffic (%)						
Lane Group Flow (vph)	130	130	446	0	261	1402
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	22		11			11
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	1		1	1
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	35	35	35		35	35
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	35	35	35		35	35
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Turn Type		pm+ov			pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8			6	
Detector Phase	8	1	2		1	6
Switch Phase						
Minimum Initial (s)	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	31.0	11.0	29.0		11.0	11.0
Total Split (s)	33.0	20.0	47.0	0.0	20.0	67.0
Total Split (%)	33.0%	20.0%	47.0%	0.0%	20.0%	67.0%

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Maximum Green (s)	28.0	15.0	42.0		15.0	62.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.5	1.5	1.5		1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	5.0	5.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	19.0		17.0			
Pedestrian Calls (#/hr)	8		8			
Act Effct Green (s)	14.5	29.9	60.1		75.5	75.5
Actuated g/C Ratio	0.14	0.30	0.60		0.76	0.76
v/c Ratio	0.52	0.28	0.23		0.37	0.54
Control Delay	46.4	17.5	11.4		6.1	7.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	46.4	17.5	11.4		6.1	7.0
LOS	D	B	B		A	A
Approach Delay	31.9		11.4			6.9
Approach LOS	C		B			A

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 62 (62%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.54			
Intersection Signal Delay: 10.5		Intersection LOS: B	
Intersection Capacity Utilization 50.6%		ICU Level of Service A	
Analysis Period (min) 15			

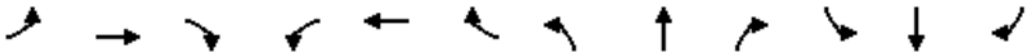
Splits and Phases: 1: Quadrant & E. 55th St

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1250	160	80	1220	230	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	625		300	0
Storage Lanes		0	1		2	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	0.91	0.91	1.00	0.95	0.97	1.00
Frt	0.983					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	4832	0	1711	3421	3319	1531
Flt Permitted			0.120		0.950	
Satd. Flow (perm)	4832	0	216	3421	3319	1531
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	35			35	25	
Link Distance (ft)	1145			1919	714	
Travel Time (s)	22.3			37.4	19.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1359	174	87	1326	250	196
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1533	0	87	1326	250	196
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	22	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)		9	15		15	9
Number of Detectors	1		1	1	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	35		35	35	35	35
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	35		35	35	35	35
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Turn Type			pm+pt			pm+ov
Protected Phases	2		1	6	4	1
Permitted Phases			6			4
Detector Phase	2		1	6	4	1
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	6.0	6.0
Minimum Split (s)	32.0		11.0	11.0	11.0	11.0
Total Split (s)	58.0	0.0	20.0	78.0	22.0	20.0
Total Split (%)	58.0%	0.0%	20.0%	78.0%	22.0%	20.0%

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Maximum Green (s)	53.0		15.0	73.0	17.0	15.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.5		1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	C-Max		None	C-Max	None	None
Walk Time (s)	7.0					
Flash Dont Walk (s)	20.0					
Pedestrian Calls (#/hr)	8					
Act Effct Green (s)	57.2		77.2	77.2	12.8	32.8
Actuated g/C Ratio	0.57		0.77	0.77	0.13	0.33
v/c Ratio	0.55		0.22	0.50	0.59	0.39
Control Delay	14.7		16.0	10.3	41.4	23.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	14.7		16.0	10.3	41.4	23.9
LOS	B		B	B	D	C
Approach Delay	14.7			10.7	33.7	
Approach LOS	B			B	C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 6 (6%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 15.5		Intersection LOS: B	
Intersection Capacity Utilization 51.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Opportunity Corridor & Quadrant

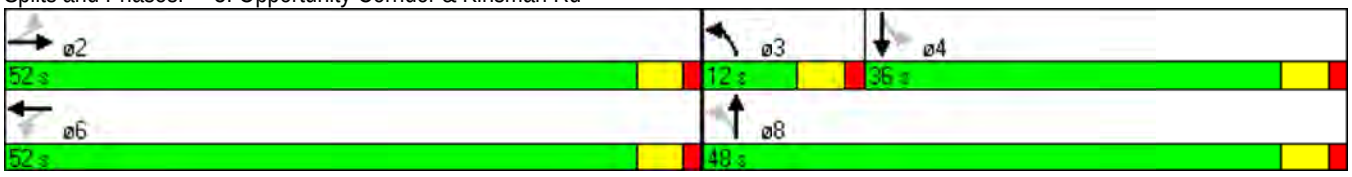


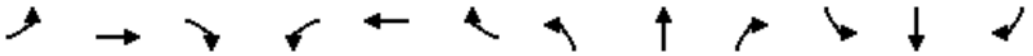
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1160	250	10	1160	10	130	230	10	10	250	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	340		0	390		0	220		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.973			0.999			0.994			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4783	0	1711	3418	0	1711	3401	0	1711	3401	0
Flt Permitted	0.155			0.125			0.374			0.591		
Satd. Flow (perm)	279	4783	0	225	3418	0	673	3401	0	1064	3401	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1919			2120			705			713	
Travel Time (s)		37.4			41.3			13.7			13.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	1261	272	11	1261	11	141	250	11	11	272	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	1533	0	11	1272	0	141	261	0	11	283	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		2			6		3	8			4	
Permitted Phases	2			6			8	8		4		
Detector Phase	2	2		6	6		3	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		12.0	36.0		36.0	36.0	
Total Split (s)	52.0	52.0	0.0	52.0	52.0	0.0	12.0	48.0	0.0	36.0	36.0	0.0
Total Split (%)	52.0%	52.0%	0.0%	52.0%	52.0%	0.0%	12.0%	48.0%	0.0%	36.0%	36.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	47.0	47.0		47.0	47.0		7.0	43.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8			8		8	8	
Act Effct Green (s)	61.6	61.6		61.6	61.6		28.4	28.4		16.4	16.4	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.28	0.28		0.16	0.16	
v/c Ratio	0.06	0.52		0.08	0.60		0.53	0.27		0.06	0.51	
Control Delay	8.7	8.1		3.2	3.8		34.1	27.3		31.2	40.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.7	8.1		3.2	3.8		34.1	27.3		31.2	40.1	
LOS	A	A		A	A		C	C		C	D	
Approach Delay		8.1			3.8			29.7			39.8	
Approach LOS		A			A			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 21 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 11.7		Intersection LOS: B	
Intersection Capacity Utilization 59.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 3: Opportunity Corridor & Kinsman Rd



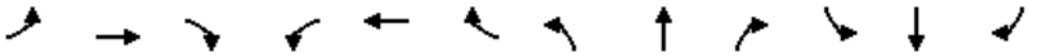


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1130	10	20	1150	10	10	20	20	10	40	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	450		0	150		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.999			0.925			0.969	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4911	0	1711	3418	0	1711	1666	0	1711	1745	0
Flt Permitted	0.200			0.208			0.722			0.728		
Satd. Flow (perm)	360	4911	0	375	3418	0	1300	1666	0	1311	1745	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		2120			925			700			775	
Travel Time (s)		41.3			18.0			19.1			21.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1228	11	22	1250	11	11	22	22	11	43	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	1239	0	22	1261	0	11	44	0	11	54	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		36.0	36.0		36.0	36.0	
Total Split (s)	64.0	64.0	0.0	64.0	64.0	0.0	36.0	36.0	0.0	36.0	36.0	0.0
Total Split (%)	64.0%	64.0%	0.0%	64.0%	64.0%	0.0%	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		24.0	24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8		8	8		8	8	
Act Effct Green (s)	80.7	80.7		80.7	80.7		12.5	12.5		12.5	12.5	
Actuated g/C Ratio	0.81	0.81		0.81	0.81		0.12	0.12		0.12	0.12	
v/c Ratio	0.15	0.31		0.07	0.46		0.07	0.21		0.07	0.25	
Control Delay	1.4	0.5		2.5	1.9		33.4	37.7		33.4	38.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	1.4	0.5		2.5	1.9		33.4	37.7		33.4	38.5	
LOS	A	A		A	A		C	D		C	D	
Approach Delay		0.5			1.9			36.9			37.7	
Approach LOS		A			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 79 (79%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 2.8		Intersection LOS: A	
Intersection Capacity Utilization 48.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 4: Opportunity Corridor & E. 75th St

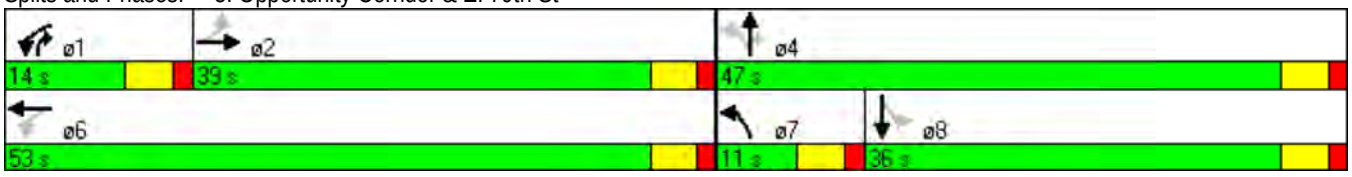


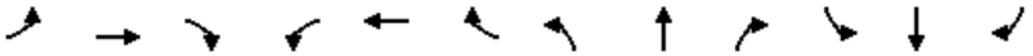
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	950	180	210	1010	10	120	170	170	10	260	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		0	725		0	400		400	400		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.999				0.850		0.976	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4798	0	1711	3418	0	1711	1801	1531	1711	1757	0
Flt Permitted	0.257			0.104			0.224			0.641		
Satd. Flow (perm)	463	4798	0	187	3418	0	403	1801	1531	1154	1757	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		925			2311			781			663	
Travel Time (s)		18.0			45.0			21.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1033	196	228	1098	11	130	185	185	11	283	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	1229	0	228	1109	0	130	185	185	11	337	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	1	1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35	35	35	35	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	35	35		35	35		35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Perm			pm+pt			pm+pt		pm+ov	Perm		
Protected Phases		2		1	6		7	4	1		8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		1	6		7	4	1	8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	32.0	32.0		11.0	32.0		11.0	36.0	11.0	36.0	36.0	
Total Split (s)	39.0	39.0	0.0	14.0	53.0	0.0	11.0	47.0	14.0	36.0	36.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	14.0%	53.0%	0.0%	11.0%	47.0%	14.0%	36.0%	36.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	34.0	34.0		9.0	48.0		6.0	42.0	9.0	31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead			Lead		Lead	Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0			7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8			8			8		8	8	
Act Effct Green (s)	36.1	36.1		54.8	54.8		35.2	35.2	53.9	24.2	24.2	
Actuated g/C Ratio	0.36	0.36		0.55	0.55		0.35	0.35	0.54	0.24	0.24	
v/c Ratio	0.26	0.71		0.73	0.59		0.59	0.29	0.22	0.04	0.79	
Control Delay	14.5	14.7		30.6	7.3		33.2	23.6	12.4	26.2	49.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	14.5	14.7		30.6	7.3		33.2	23.6	12.4	26.2	49.1	
LOS	B	B		C	A		C	C	B	C	D	
Approach Delay		14.7			11.3			22.0			48.4	
Approach LOS		B			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 72 (72%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 17.8		Intersection LOS: B	
Intersection Capacity Utilization 74.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: Opportunity Corridor & E. 79th St





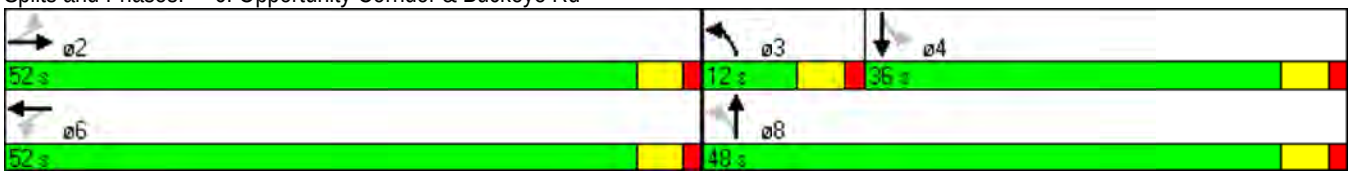
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	980	130	40	1140	10	70	550	220	10	650	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	290		0	425		0	225		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.982			0.999			0.957			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4827	0	1711	3418	0	1711	3274	0	1711	3414	0
Flt Permitted	0.127			0.177			0.151			0.280		
Satd. Flow (perm)	229	4827	0	319	3418	0	272	3274	0	504	3414	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		2311			651			862			1038	
Travel Time (s)		45.0			12.7			16.8			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	1065	141	43	1239	11	76	598	239	11	707	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	1206	0	43	1250	0	76	837	0	11	718	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		2			6		3	8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		3	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		12.0	36.0		36.0	36.0	
Total Split (s)	52.0	52.0	0.0	52.0	52.0	0.0	12.0	48.0	0.0	36.0	36.0	0.0
Total Split (%)	52.0%	52.0%	0.0%	52.0%	52.0%	0.0%	12.0%	48.0%	0.0%	36.0%	36.0%	0.0%

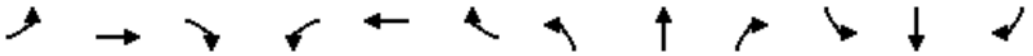
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	47.0	47.0		47.0	47.0		7.0	43.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8			8		8	8	
Act Effct Green (s)	53.2	53.2		53.2	53.2		36.8	36.8		27.2	27.2	
Actuated g/C Ratio	0.53	0.53		0.53	0.53		0.37	0.37		0.27	0.27	
v/c Ratio	0.09	0.47		0.25	0.69		0.38	0.70		0.08	0.77	
Control Delay	6.3	5.3		14.5	13.4		24.5	29.6		27.3	39.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.3	5.3		14.5	13.4		24.5	29.6		27.3	39.8	
LOS	A	A		B	B		C	C		C	D	
Approach Delay		5.3			13.5			29.2			39.6	
Approach LOS		A			B			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 73.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: Opportunity Corridor & Buckeye Rd





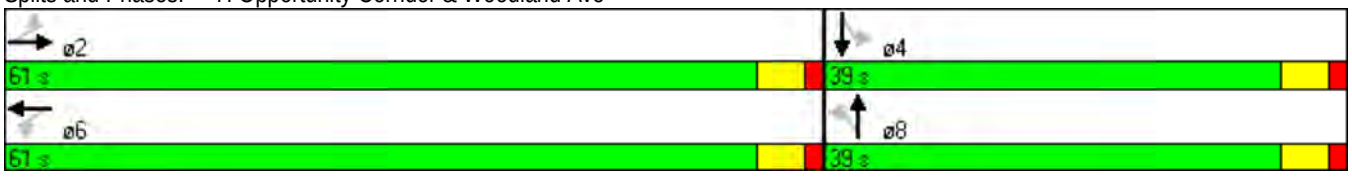
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	960	240	10	1170	80	110	180	10	50	200	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	315		0	650		0	375		0	225		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.970			0.990			0.992			0.993	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4768	0	1711	3387	0	1711	3394	0	1711	3397	0
Flt Permitted	0.163			0.186			0.579			0.611		
Satd. Flow (perm)	294	4768	0	335	3387	0	1043	3394	0	1100	3397	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		651			1033			944			1183	
Travel Time (s)		12.7			20.1			18.4			23.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	1043	261	11	1272	87	120	196	11	54	217	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	1304	0	11	1359	0	120	207	0	54	228	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2	2		6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		36.0	36.0		36.0	36.0	
Total Split (s)	61.0	61.0	0.0	61.0	61.0	0.0	39.0	39.0	0.0	39.0	39.0	0.0
Total Split (%)	61.0%	61.0%	0.0%	61.0%	61.0%	0.0%	39.0%	39.0%	0.0%	39.0%	39.0%	0.0%

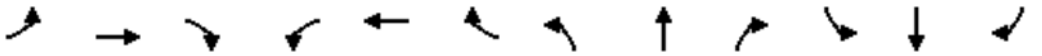
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	56.0	56.0		56.0	56.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		24.0	24.0		24.0	24.0	
Pedestrian Calls (#/hr)	8	8		8	8		8	8		8	8	
Act Effct Green (s)	72.3	72.3		72.3	72.3		17.7	17.7		17.7	17.7	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.18	0.18		0.18	0.18	
v/c Ratio	0.05	0.38		0.05	0.56		0.65	0.34		0.28	0.38	
Control Delay	3.3	2.7		2.3	3.3		52.5	35.8		35.7	36.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3.3	2.7		2.3	3.3		52.5	35.8		35.7	36.3	
LOS	A	A		A	A		D	D		D	D	
Approach Delay		2.7			3.3			41.9			36.2	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 28 (28%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 9.7 Intersection LOS: A
Intersection Capacity Utilization 59.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 7: Opportunity Corridor & Woodland Ave



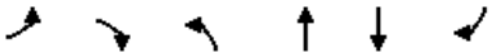


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	780	10	130	930	10	10	360	180	10	430	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	460		0	500		0	190		190	290		240
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3421	1531	1711	3414	0	1711	1801	1531	1711	1801	1531
Flt Permitted	0.131			0.333			0.171			0.274		
Satd. Flow (perm)	236	3421	1531	600	3414	0	308	1801	1531	493	1801	1531
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		1033			2188			492			838	
Travel Time (s)		20.1			42.6			11.2			22.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	848	11	141	1011	11	11	391	196	11	467	348
Shared Lane Traffic (%)												
Lane Group Flow (vph)	250	848	11	141	1022	0	11	391	196	11	467	348
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	35	35	35	35	35		35	35	35	35	35	35
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	35	35	35	35	35		35	35	35	35	35	35
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt		Perm	Perm			Perm		Perm	Perm		Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6			8		8	4		4
Detector Phase	5	2	2	6	6		8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	12.0	32.0	32.0	32.0	32.0		36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	21.0	62.0	62.0	41.0	41.0	0.0	38.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	21.0%	62.0%	62.0%	41.0%	41.0%	0.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	16.0	57.0	57.0	36.0	36.0		33.0	33.0	33.0	33.0	33.0	33.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max		None	None	None	None	None	None
Walk Time (s)		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		20.0	20.0	20.0	20.0		24.0	24.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)		8	8	8	8		8	8	8	8	8	8
Act Effct Green (s)	60.1	60.1	60.1	41.6	41.6		29.9	29.9	29.9	29.9	29.9	29.9
Actuated g/C Ratio	0.60	0.60	0.60	0.42	0.42		0.30	0.30	0.30	0.30	0.30	0.30
v/c Ratio	0.73	0.41	0.01	0.56	0.72		0.12	0.73	0.43	0.07	0.87	0.76
Control Delay	24.8	11.5	7.6	33.7	27.8		27.5	39.5	30.6	24.9	50.4	43.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	11.5	7.6	33.7	27.8		27.5	39.5	30.6	24.9	50.4	43.0
LOS	C	B	A	C	C		C	D	C	C	D	D
Approach Delay		14.5			28.5			36.4			46.9	
Approach LOS		B			C			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 81 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 29.7		Intersection LOS: C	
Intersection Capacity Utilization 73.9%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 8: Opportunity Corridor & E. 93rd St

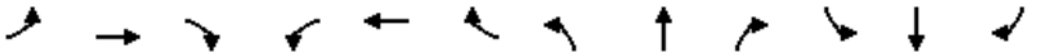


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	10	90	870	1050	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	100			600
Storage Lanes	1	1	1			0
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.850			0.997	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1711	1531	1711	3421	3411	0
Flt Permitted	0.950		0.231			
Satd. Flow (perm)	1711	1531	416	3421	3411	0
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	35			35	30	
Link Distance (ft)	1147			2188	1451	
Travel Time (s)	22.3			42.6	33.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	11	98	946	1141	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	11	11	98	946	1163	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			12	11	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane					Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	
Detector Template	Left	Right	Left	Thru	Thru	
Leading Detector (ft)	35	35	35	35	35	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Turn Type		custom	Perm			
Protected Phases				2	6	
Permitted Phases	4	4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	32.0	32.0	32.0	32.0	24.0	
Total Split (s)	32.0	32.0	68.0	68.0	68.0	0.0
Total Split (%)	32.0%	32.0%	68.0%	68.0%	68.0%	0.0%

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Maximum Green (s)	27.0	27.0	63.0	63.0	63.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	11.0	
Pedestrian Calls (#/hr)	8	8	8	8	8	
Act Effct Green (s)	10.4	10.4	86.0	86.0	86.0	
Actuated g/C Ratio	0.10	0.10	0.86	0.86	0.86	
v/c Ratio	0.06	0.07	0.27	0.32	0.40	
Control Delay	35.8	36.1	7.3	3.6	3.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	35.8	36.1	7.3	3.6	3.6	
LOS	D	D	A	A	A	
Approach Delay	35.9			3.9	3.6	
Approach LOS	D			A	A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 45 (45%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 4.0		Intersection LOS: A	
Intersection Capacity Utilization 52.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 9: Quincy Ave &



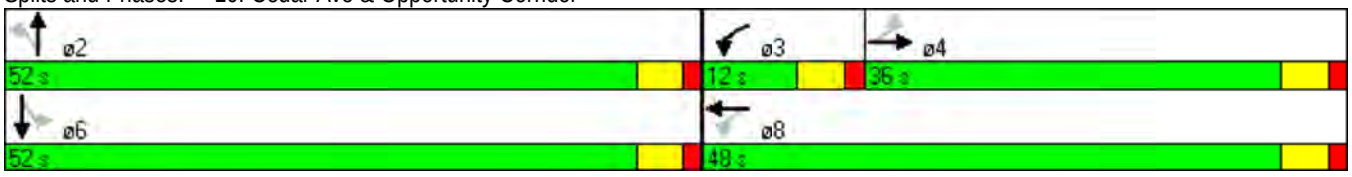
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	250	40	140	170	70	20	500	310	60	840	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	255		0	350		0	600		0	325		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.95	0.95
Frt		0.980			0.956			0.943			0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3353	0	1711	1721	0	1711	4636	0	1711	3394	0
Flt Permitted	0.598			0.341			0.247			0.293		
Satd. Flow (perm)	1077	3353	0	614	1721	0	445	4636	0	528	3394	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			30			35	
Link Distance (ft)		1015			1164			668			652	
Travel Time (s)		19.8			22.7			15.2			12.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	272	43	152	185	76	22	543	337	65	913	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	315	0	152	261	0	22	880	0	65	967	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes						Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		12.0	32.0		24.0	24.0		32.0	32.0	
Total Split (s)	36.0	36.0	0.0	12.0	48.0	0.0	52.0	52.0	0.0	52.0	52.0	0.0
Total Split (%)	36.0%	36.0%	0.0%	12.0%	48.0%	0.0%	52.0%	52.0%	0.0%	52.0%	52.0%	0.0%

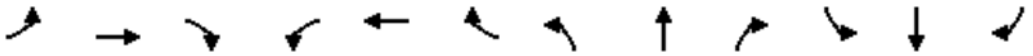
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	31.0	31.0		7.0	43.0		47.0	47.0		47.0	47.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0		11.0	11.0		20.0	20.0	
Pedestrian Calls (#/hr)	8	8			8		8	8		8	8	
Act Effct Green (s)	16.6	16.6		28.6	28.6		61.4	61.4		61.4	61.4	
Actuated g/C Ratio	0.17	0.17		0.29	0.29		0.61	0.61		0.61	0.61	
v/c Ratio	0.55	0.57		0.60	0.53		0.08	0.31		0.20	0.46	
Control Delay	48.5	41.6		37.5	33.3		11.7	15.2		11.5	10.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.5	41.6		37.5	33.3		11.7	15.2		11.5	10.4	
LOS	D	D		D	C		B	B		B	B	
Approach Delay		43.2			34.8			15.1			10.4	
Approach LOS		D			C			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 2 (2%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 20.5 Intersection LOS: C
Intersection Capacity Utilization 64.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 10: Cedar Ave & Opportunity Corridor



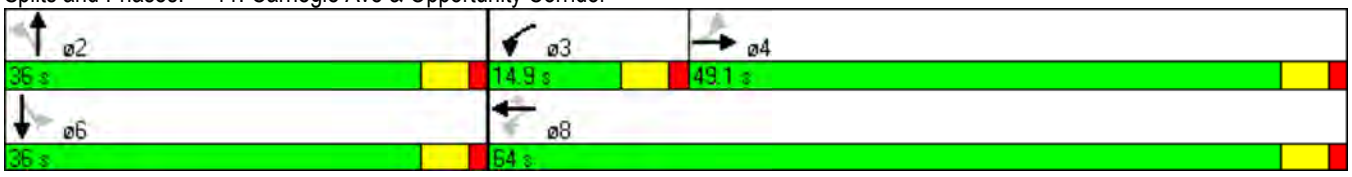


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	1390	10	150	770	60	50	580	50	80	750	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	625		0	250		640	150		0	500		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.91	0.91	1.00	0.95	0.95
Frt		0.999				0.850		0.988			0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	3418	0	1711	3421	1531	1711	4857	0	1711	3394	0
Flt Permitted	0.337			0.080			0.137			0.305		
Satd. Flow (perm)	607	3418	0	144	3421	1531	247	4857	0	549	3394	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1245			1288			652			918	
Travel Time (s)		24.3			25.1			12.7			17.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	1511	11	163	837	65	54	630	54	87	815	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	1522	0	163	837	65	54	684	0	87	858	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link ffset(ft)	O	0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes			Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number f Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35	35	35	35		35	35	
Trailing etector (ft)	0	0		0	0	0	0	0		0	0	
Detector Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	35	35		35	35	35	35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm			pm+pt		Perm	Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8		8	2			6		
Detector hase P	4	4		3	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	32.0	32.0		12.0	32.0	32.0	36.0	36.0		32.0	32.0	
Total Split (s)	49.1	49.1	0.0	14.9	64.0	64.0	36.0	36.0	0.0	36.0	36.0	0.0
Total Split (%)	49.1%	49.1%	0.0%	14.9%	64.0%	64.0%	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	44.1	44.1		9.9	59.0	59.0	31.0	31.0		31.0	31.0	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?				Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0			20.0	20.0	24.0	24.0		20.0	20.0	
Pedestrian alls (#/hr)	8	8			8	8	8	8		8	8	
Act Effct Green (s)	44.8	44.8		59.0	59.0	59.0	31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.45	0.45		0.59	0.59	0.59	0.31	0.31		0.31	0.31	
v/c Ratio	0.28	0.99		0.71	0.41	0.07	0.70	0.45		0.51	0.82	
Control Delay	21.4	50.1		35.5	11.9	9.1	68.7	20.1		49.9	47.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	21.4	50.1		35.5	11.9	9.1	68.7	20.1		49.9	47.0	
LOS	C	D		D	B	A	E	C		D	D	
Approach Delay		48.8			15.3			23.7			47.3	
Approach LOS		D			B			C			D	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 36.0	Intersection LOS: D
Intersection Capacity Utilization 90.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 11: Carnegie Ave & Opportunity Corridor



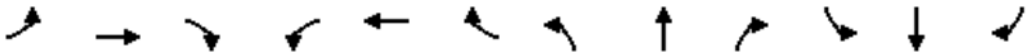
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	320	90	290	370	20	90	530	110	40	440	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		0	525		0	350		0	225		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt		0.967			0.992				0.850		0.948	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	1741	0	1711	1786	0	1711	3421	1531	1711	3243	0
Flt Permitted	0.950			0.950			0.197			0.299		
Satd. Flow (perm)	1711	1741	0	1711	1786	0	355	3421	1531	538	3243	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1124			935			918			658	
Travel Time (s)		30.7			25.5			17.9			12.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	348	98	315	402	22	98	576	120	43	478	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	315	446	0	315	424	0	98	576	120	43	728	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	1	1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35	35	35	35	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	35	35		35	35		35	35	35	35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot			Prot			Perm		pm+ov	Perm		
Protected Phases	7	4		3	8			2	3		6	
Permitted Phases							2		2	6		
Detector Phase	7	4		3	8		2	2	3	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	11.0	37.0		11.0	37.0		32.0	32.0	11.0	32.0	32.0	
Total Split (s)	31.0	37.0	0.0	31.0	37.0	0.0	32.0	32.0	31.0	32.0	32.0	0.0
Total Split (%)	31.0%	37.0%	0.0%	31.0%	37.0%	0.0%	32.0%	32.0%	31.0%	32.0%	32.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	26.0	27.0		26.0	27.0		27.0	27.0	26.0	27.0	27.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	6.5		1.5	6.5		1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	10.0	4.0	5.0	10.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag				Lead			
Lead-Lag Optimize?				Yes					Yes			
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max	None	C-Max	C-Max	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		8			8		8	8		8	8	
Act Effct Green (s)	22.4	28.0		22.4	28.0		29.6	29.6	57.0	29.6	29.6	
Actuated g/C Ratio	0.22	0.28		0.22	0.28		0.30	0.30	0.57	0.30	0.30	
v/c Ratio	0.82	0.92		0.82	0.85		0.93	0.57	0.14	0.27	0.76	
Control Delay	54.6	60.6		54.6	51.5		93.7	14.2	4.1	20.8	25.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	54.6	60.6		54.6	51.5		93.7	14.2	4.1	20.8	25.0	
LOS	D	E		D	D		F	B	A	C	C	
Approach Delay		58.1			52.8			22.5			24.8	
Approach LOS		E			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 4 (4%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 39.2 Intersection LOS: D
Intersection Capacity Utilization 83.7% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 12: Euclid Ave & Opportunity Corridor

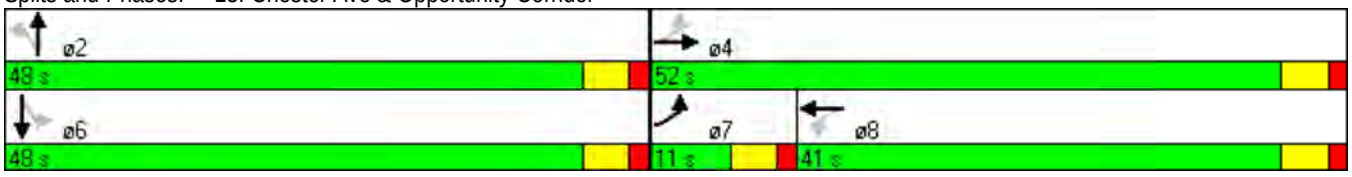


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	1400	110	10	500	30	50	730	90	40	560	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	600		0	340		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.989			0.991			0.984			0.977	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1711	4862	0	1711	3390	0	1711	3367	0	1711	3343	0
Flt Permitted	0.285			0.118			0.303			0.223		
Satd. Flow (perm)	513	4862	0	212	3390	0	546	3367	0	402	3343	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1230			1070			658			1379	
Travel Time (s)		24.0			20.8			12.8			26.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	1522	120	11	543	33	54	793	98	43	609	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	1642	0	11	576	0	54	891	0	43	718	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			11			11	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	35	35		35	35		35	35		35	35	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	35	35		35	35		35	35		35	35	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0	32.0		32.0	32.0		32.0	32.0		32.0	32.0	
Total Split (s)	11.0	52.0	0.0	41.0	41.0	0.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	11.0%	52.0%	0.0%	41.0%	41.0%	0.0%	48.0%	48.0%	0.0%	48.0%	48.0%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	6.0	47.0		36.0	36.0		43.0	43.0		43.0	43.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		8		8	8		8	8		8	8	
Act Effct Green (s)	42.7	42.7		33.9	33.9		47.3	47.3		47.3	47.3	
Actuated g/C Ratio	0.43	0.43		0.34	0.34		0.47	0.47		0.47	0.47	
v/c Ratio	0.34	0.79		0.15	0.50		0.21	0.56		0.23	0.45	
Control Delay	19.6	27.8		28.8	28.1		16.6	16.7		21.4	19.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.6	27.8		28.8	28.1		16.6	16.7		21.4	19.5	
LOS	B	C		C	C		B	B		C	B	
Approach Delay		27.3			28.1			16.7			19.6	
Approach LOS		C			C			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 23.5		Intersection LOS: C	
Intersection Capacity Utilization 79.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 13: Chester Ave & Opportunity Corridor



Appendix H: HCS Analysis Results - Freeway Segment and Ramp (2020 AM Peak Hour)

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/7/2012
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 S on ramp to I-490 E
From/To:	I-77 S to merge w/ I-77 N ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-1

Flow Inputs and Adjustments

Volume, V	300	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	82	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	167	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	167	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	3.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 N on ramp to I-490 E
From/To:	I-77 N to merge w/ I-77 S ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-2

Flow Inputs and Adjustments

Volume, V	700	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	190	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	390	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	390	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	7.1	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 on ramp to I-490 E
From/To:	N/S ramp merge to I-490E
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-3

Flow Inputs and Adjustments

Volume, V	1000	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	272	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	557	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	557	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	10.1	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-490 EB
From/To:	I-77 off ramp to I-77 on ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-4

Flow Inputs and Adjustments

Volume, V	1560	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	424	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	873	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	873	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	13.4	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	AM Peak
Freeway/Direction:	I-77 SB on Ramp
From/To:	from I-490 WB to I-77
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-5

Flow Inputs and Adjustments

Volume, V	1380	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	367	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	752	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	752	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	11.6	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	AM Peak
Freeway/Direction:	I-77 SB on Ramp
From/To:	from I-490 WB to I-77 SB
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-6

Flow Inputs and Adjustments

Volume, V	880	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	234	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	480	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	480	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	8.7	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	AM Peak
Freeway/Direction:	I-77 NB on Ramp
From/To:	from I-490 WB to I-77 NB
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-7

Flow Inputs and Adjustments

Volume, V	500	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	133	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	273	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	273	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	5.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	AM Peak
Freeway/Direction:	I-490 WB
From/To:	I-77 off ramp to I-77 on ramp
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-8

Flow Inputs and Adjustments

Volume, V	830	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	221	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	453	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	453	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	2	
Density, D	6.5	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	RAW
Agency/Co.:	HNTB
Date performed:	3/1/2012
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-490 WB
Junction:	I-490 WB diverge to I-77
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: M-2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	830	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	mph
Volume on ramp	690	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	830	690		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	231	192		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	945	786	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.700 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 897 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	945	7050	No
$v_{FO} = v_F - v_R$	159	7050	No
v_R	786	2200	No
v_3 or v_{av34}	48 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 897 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	897	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.174	
Space mean speed in ramp influence area,	S_R = 61.0	mph
Space mean speed in outer lanes,	S_0 = 71.3	mph
Space mean speed for all vehicles,	S = 61.5	mph

Appendix I: HCS Analysis Results - Freeway Segment and Ramp (2020 PM Peak Hour)

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/7/2012
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 S on ramp to I-490 E
From/To:	I-77 S to merge w/ I-77 N ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-1

Flow Inputs and Adjustments

Volume, V	480	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	130	v
Trucks and buses	9	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.957	
Driver population factor, fp	1.00	
Flow rate, vp	273	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	273	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	5.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 N on ramp to I-490 E
From/To:	I-77 N to merge w/ I-77 S ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-2

Flow Inputs and Adjustments

Volume, V	700	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	190	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	390	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	390	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	7.1	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 on ramp to I-490 E
From/To:	N/S ramp merge to I-490E
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-3

Flow Inputs and Adjustments

Volume, V	1180	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	321	v
Trucks and buses	9	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.957	
Driver population factor, fp	1.00	
Flow rate, vp	670	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	670	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	12.2	pc/mi/ln
Level of service, LOS	B	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	VNW
Agency or Company:	HNTB
Date Performed:	2/8/2012
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-490 EB
From/To:	I-77 off ramp to I-77 on ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-4

Flow Inputs and Adjustments

Volume, V	820	veh/h
Peak-hour factor, PHF	0.92	
Peak 15-min volume, v15	223	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	455	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	455	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	7.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	PM Peak
Freeway/Direction:	I-77 SB on Ramp
From/To:	from I-490 WB to I-77
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-5

Flow Inputs and Adjustments

Volume, V	1000	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	266	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	545	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	545	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	8.4	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	PM Peak
Freeway/Direction:	I-77 SB on Ramp
From/To:	from I-490 WB to I-77 SB
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-6

Flow Inputs and Adjustments

Volume, V	740	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	197	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	403	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

LOS and Performance Measures

Flow rate, vp	403	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	7.3	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	PM Peak
Freeway/Direction:	I-77 NB on Ramp
From/To:	from I-490 WB to I-77 NB
Jurisdiction:	
Analysis Year:	2020
Description:	Opportunity Corridor Recommended Preferred Alternative: F-7

Flow Inputs and Adjustments

Volume, V	260	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	69	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	142	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	70.0	mi/h

LOS and Performance Measures

Flow rate, vp	142	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	2	
Density, D	2.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RAW
Agency or Company:	HNTB
Date Performed:	2/29/2012
Analysis Time Period:	
Freeway/Direction:	I-490 WB
From/To:	I-77 off ramp to I-77 on ramp
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: F-8

Flow Inputs and Adjustments

Volume, V	950	veh/h
Peak-hour factor, PHF	0.94	
Peak 15-min volume, v15	253	v
Trucks and buses	5	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.976	
Driver population factor, fp	1.00	
Flow rate, vp	518	pc/h/ln

Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	65.0	mi/h

LOS and Performance Measures

Flow rate, vp	518	pc/h/ln
Free-flow speed, FFS	65.0	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	8.0	pc/mi/ln
Level of service, LOS	A	

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	RAW
Agency/Co.:	HNTB
Date performed:	3/1/2012
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-490 WB
Junction:	I-490 WB diverge to I-77
Jurisdiction:	
Analysis Year:	2020

Description: Opportunity Corridor Recommended Preferred Alternative: M-2

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	950	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	mph
Volume on ramp	500	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	950	500		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	264	139		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.976	0.976	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1082	569	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.707 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 932 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1082	7050	No
$v_{FO} = v_F - v_R$	513	7050	No
v_R	569	2200	No
v_3 or v_{av34}	150 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 932 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	932	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 7.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.154

Space mean speed in ramp influence area, S_R = 61.5 mph

Space mean speed in outer lanes, S_0 = 71.3 mph

Space mean speed for all vehicles, S = 62.7 mph

Appendix J: Turn Lane Length Calculations

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Quadrant **N-S Road:** E55th

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	260	Left	0	Left	120
Through	0	Through	0	Through	1030	Through	250
Right	0	Right	200	Right	320	Right	0

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	120	Left	0	Left	240
Through	0	Through	0	Through	240	Through	1290
Right	0	Right	120	Right	170	Right	0

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	1	Left	0	Left	1
Through	0	Through	0	Through	2	Through	2
Right	0	Right	1	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
30	30	35	35

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound		***Westbound***		
Left	0	Left	400	
Through	0	Through	0	
Right	0	Right	325	
Northbound		***Southbound***		
Left	0	Left	375	Lane Blocked
Through	775	Through	750	
Right	0	Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Boulevard **N-S Road:** Quadrant

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	200	Left	220	Left	0
Through	1800	Through	1300	Through	0	Through	0
Right	260	Right	0	Right	220	Right	0

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	80	Left	230	Left	0
Through	1250	Through	1220	Through	0	Through	0
Right	160	Right	0	Right	180	Right	0

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	0	Left	1	Left	2	Left	0
Through	3	Through	2	Through	0	Through	0
Right	0	Right	0	Right	1	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	30	30

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound		***Westbound***		
Left	0	Left	386	Lane Blocked
Through	775	Through	750	
Right	0	Right	0	
Northbound		***Southbound***		
Left	225	Left	0	
2nd Left	175			
Through	0	Through	0	
Right	375	Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/18/12

E-W Road: Boulevard **N-S Road:** Kinsman

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	10	Left	250	Left	10
Through	1840	Through	1230	Through	300	Through	120
Right	170	Right	10	Right	10	Right	20

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	10	Left	130	Left	10
Through	1160	Through	1160	Through	230	Through	250
Right	250	Right	10	Right	10	Right	10

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	2	Through	2
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	35	35

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	161	Lane Blocked	Left	161	Lane Blocked
Through	775		Through	725	
Right	0		Right	0	
Northbound			***Southbound***		
Left	400		Left	100	Lane Blocked
Through	250		Through	200	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/18/12

E-W Road: Boulevard **N-S Road:** E75th

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	40	Left	10	Left	10	Left	10
Through	1810	Through	1230	Through	40	Through	10
Right	10	Right	10	Right	20	Right	20

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	40	Left	20	Left	10	Left	10
Through	1130	Through	1150	Through	20	Through	40
Right	10	Right	10	Right	20	Right	10

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	1	Through	1
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	30	30

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	211	Lane Blocked	Left	161	Lane Blocked
Through	725		Through	725	
Right	0		Right	0	
Northbound			***Southbound***		
Left	100		Left	100	
Through	100		Through	100	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/18/12

E-W Road: Boulevard **N-S Road:** E79th

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	40	Left	90	Left	110	Left	10
Through	1670	Through	1080	Through	330	Through	110
Right	140	Right	10	Right	140	Right	70

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	40	Left	210	Left	120	Left	10
Through	950	Through	1010	Through	170	Through	260
Right	180	Right	10	Right	170	Right	50

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	1	Through	1
Right	0	Right	0	Right	1	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	30	30

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	211	Lane Blocked	Left	386	Lane Blocked
Through	725		Through	650	
Right	0		Right	0	
Northbound			***Southbound***		
Left	225	Lane Blocked	Left	100	Lane Blocked
Through	400		Through	400	
Right	300	Lane Blocked	Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 05/08/12

E-W Road: Boulevard **N-S Road:** Buckeye

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	40	Left	210	Left	10
Through	1720	Through	960	Through	640	Through	420
Right	80	Right	10	Right	270	Right	10

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	140	Left	70	Left	10
Through	980	Through	1140	Through	550	Through	650
Right	130	Right	10	Right	220	Right	10

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	2	Through	2
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	35	35

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	161	Lane Blocked	Left	311	Lane Blocked
Through	675		Through	675	
Right	0		Right	0	
Northbound			***Southbound***		
Left	325	Lane Blocked	Left	100	Lane Blocked
Through	550		Through	400	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 05/08/12

E-W Road: Boulevard **N-S Road:** Woodland

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	10	Left	230	Left	90
Through	1820	Through	770	Through	190	Through	190
Right	170	Right	20	Right	10	Right	10

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	10	Left	110	Left	50
Through	960	Through	1170	Through	180	Through	200
Right	240	Right	80	Right	10	Right	10

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	2	Through	2
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	35	35

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	161	Lane Blocked	Left	161	Lane Blocked
Through	775		Through	725	
Right	0		Right	0	
Northbound			***Southbound***		
Left	375		Left	200	
Through	175		Through	175	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 05/08/12

E-W Road: Boulevard **N-S Road:** 93rd

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	430	Left	40	Left	10	Left	10
Through	1480	Through	580	Through	410	Through	230
Right	10	Right	10	Right	200	Right	220

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	230	Left	130	Left	10	Left	10
Through	780	Through	930	Through	360	Through	430
Right	10	Right	10	Right	180	Right	320

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	2	Through	2	Through	1	Through	1
Right	1	Right	0	Right	1	Right	1
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
40	40	30	30

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	600	Lane Blocked	Left	311	Lane Blocked
Through	825		Through	550	
Right	161	Lane Blocked	Right	0	
Northbound			***Southbound***		
Left	100	Lane Blocked	Left	100	Lane Blocked
Through	500		Through	525	
Right	325	Lane Blocked	Right	450	Lane Blocked

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 05/08/12

E-W Road: Quincy **N-S Road:** Boulevard

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	0	Left	130	Left	0
Through	0	Through	0	Through	1550	Through	610
Right	10	Right	0	Right	0	Right	10

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	0	Left	90	Left	0
Through	0	Through	0	Through	870	Through	1050
Right	10	Right	0	Right	0	Right	20

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	0	Left	1	Left	0
Through	0	Through	0	Through	2	Through	2
Right	1	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
35	35	40	40

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound		***Westbound***	
Left	100	Left	0
Through	0	Through	0
Right	100	Right	0
Northbound		***Southbound***	
Left	311 Lane Blocked	Left	0
Through	850	Through	625
Right	0	Right	0

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Cedar **N-S Road:** Boulevard

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	70	Left	140	Left	30	Left	30
Through	310	Through	180	Through	1050	Through	460
Right	10	Right	100	Right	420	Right	70

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	90	Left	140	Left	20	Left	60
Through	250	Through	170	Through	500	Through	840
Right	40	Right	70	Right	310	Right	50

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	2	Through	1	Through	3	Through	2
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
35	35	40	40

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	200	Lane Blocked	Left	250	Lane Blocked
Through	250		Through	375	
Right	0		Right	0	
Northbound			***Southbound***		
Left	161	Lane Blocked	Left	211	Lane Blocked
Through	600		Through	525	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Carnegie **N-S Road:** Boulevard

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	10	Left	180	Left	50	Left	40
Through	530	Through	1530	Through	1050	Through	380
Right	30	Right	110	Right	20	Right	10

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	70	Left	150	Left	50	Left	80
Through	1390	Through	770	Through	580	Through	750
Right	10	Right	60	Right	50	Right	40

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	2	Through	2	Through	3	Through	2
Right	0	Right	1	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
35	35	40	40

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	200	Lane Blocked	Left	300	Lane Blocked
Through	800		Through	850	
Right	0		Right	225	Lane Blocked
Northbound			***Southbound***		
Left	211	Lane Blocked	Left	261	Lane Blocked
Through	450		Through	500	
Right	0		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Euclid **N-S Road:** Boulevard

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	160	Left	40	Left	90	Left	10
Through	300	Through	410	Through	520	Through	310
Right	60	Right	20	Right	480	Right	260

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	290	Left	290	Left	90	Left	40
Through	320	Through	370	Through	530	Through	440
Right	90	Right	20	Right	110	Right	230

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	1	Through	1	Through	2	Through	2
Right	0	Right	0	Right	1	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
30	30	40	40

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	425	Lane Blocked	Left	425	Lane Blocked
Through	500		Through	525	
Right	0		Right	0	
Northbound			***Southbound***		
Left	261	Lane Blocked	Left	211	Lane Blocked
Through	350		Through	450	
Right	661		Right	0	

Turn Lane Length Worksheet

Project ID: Opportunity Corridor PID 77333 **Date:** 04/17/12

E-W Road: Chester **N-S Road:** Boulevard

Analyst: TVF **Metric (y,n):** n

Input Values:

A.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	170	Left	10	Left	90	Left	40
Through	510	Through	1120	Through	530	Through	460
Right	90	Right	90	Right	30	Right	10

P.M. Peak Hour Volume (vehicles)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	90	Left	10	Left	50	Left	40
Through	1400	Through	500	Through	730	Through	560
Right	110	Right	30	Right	90	Right	100

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound		*Westbound*		*Northbound*		*Southbound*	
Left	1	Left	1	Left	1	Left	1
Through	3	Through	2	Through	2	Through	2
Right	0	Right	0	Right	0	Right	0
Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n	Offset Left ? (y,n)	n
Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0	Offset Dist. (ft.)	0

Design Speed (mph)

Eastbound	Westbound	Northbound	Southbound
35	35	40	40

Cycle Length

AM (sec)	120
PM (sec)	120

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Eastbound			***Westbound***		
Left	300	Lane Blocked	Left	100	Lane Blocked
Through	600		Through	725	
Right	0		Right	0	
Northbound			***Southbound***		
Left	261	Lane Blocked	Left	211	Lane Blocked
Through	500		Through	400	
Right	0		Right	0	